



SYMPOSIUM 2016

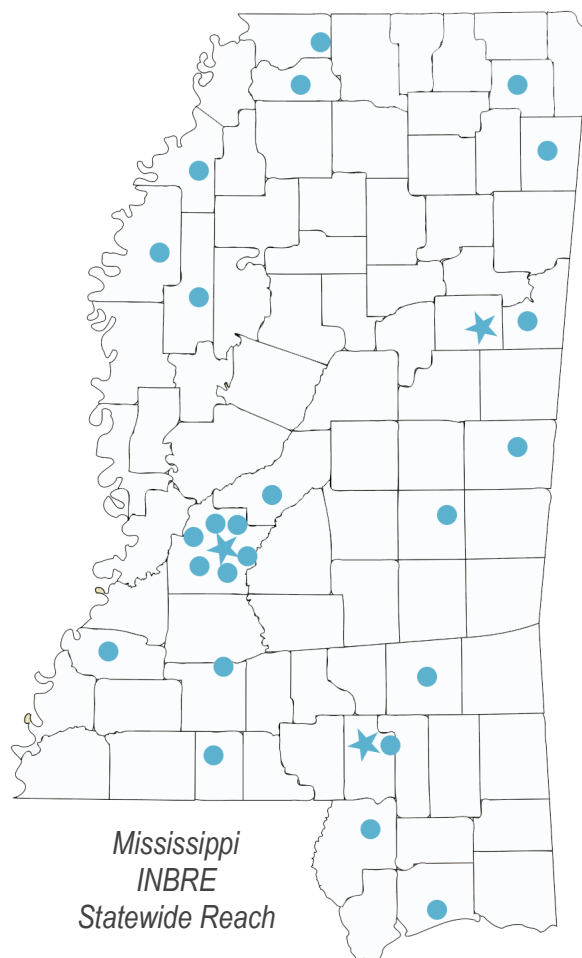
Our Mission:

- Build biomedical infrastructure
- Train students in biomedical research
- Improve health in Mississippi

Mississippi INBRE provides awards to researchers at primarily undergraduate institutions throughout Mississippi to support research and curriculum development.

Mississippi INBRE hosts two summer internship programs: Mississippi INBRE Research Scholars and Mississippi INBRE Service Scholars. These internships provide undergraduate students with laboratory or public health education training.

Mississippi INBRE funds core research facilities accessible to researchers and students across the State. These facilities are located at the University of Southern Mississippi, Mississippi State University and the University of Mississippi Medical Center.





July 28, 2016

Dear Colleagues,

We are happy to welcome you to the Mississippi INBRE Symposium 2016!

This has been another fruitful year and we have had the opportunity to interact with many faculty and students as we all work to enhance biomedical research and training in Mississippi. Today we will have approximately sixty poster presentations, all of which are from undergraduate students. Helping students gain experience in hands-on biomedical research is one of our major goals – and all the more important since the students of today are the ones who will go forward to discover great things as they broaden our scientific field.

The work of the Mississippi INBRE depends on the generous funding from the National Institutes of Health. Please remember to acknowledge this funding on all your publications and presentations (and send us the citation information) now and in the future: “This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.”

We hope you enjoy the evening’s events and take opportunities to network with your colleagues from across the State – who knows what amazing research collaborations may arise!

Best regards,

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Mississippi INBRE Research Scholars (MIRS)

R.1 **SECIS binding protein 2 (SBP2) has a role in tick fecundity and *Rickettsia parkeri* colonization and transovarial transmission in *Amblyomma maculatum***

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Ticks are hematophagous ectoparasitic arthropods that are the second deadliest vector of disease after mosquitoes. *Amblyomma maculatum* is the known vector of *Rickettsia parkeri*, an infectious bacterial pathogen. We hypothesized that the knockdown of tick SECIS binding protein 2 (SBP2) alter selenoproteins synthesis, tick antioxidant capacity, and pathogen colonization in *A. maculatum*. *Rickettsia parkeri* infected (Rp⁺ticks) and uninfected (Rp⁻ticks) were maintained in the Karim lab. Silencing of *SBP2* gene was performed by using dsRNA in both infected and uninfected ticks. The gene expressions and *Rickettsia parkeri* quantifications were performed by using gene specific qRT-PCR assays. The quantification of selenium in tick tissues was performed by ICP-MS technique. The knockdown of the *SBP2* gene negatively impacted Selenoprotein P (SeIP), a carrier of selenium. The selenium level in knocked down tissues further verified the role of SBP2 in selenoproteins synthesis. The mRNA level of most selenoproteins tested were either unaffected or depleted with *SBP2* except upregulation of *SeIM* in Rp⁻ticks and *SeIO* in Rp⁺ticks. The egg mass conversion between dsLacZ control and *SBP2* further suggested the impact of SBP2 or selenium in tick fecundity. Interestingly, the level of *R. parkeri* in tick eggs showed decreased rickettsial copies in *SBP2* knockdown ticks compared to dsLacZ group. Tick SPB2 plays a role in selenium levels in ticks, which may interfere in selenoproteins synthesis and subsequently impacted antioxidant capacity of ticks. The decreased selenium probably negatively impacted tick fecundity and selenoprotein synthesis, which impaired *R. parkeri* colonization and transovarial transmission.

R.2 **Lead Nitrate Induced Cytotoxic Effects to Human Leukemia (HL-60) Cells through Oxidative Stress**

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Lead is a heavy metal that is found naturally in the earth crust. Throughout history, lead has been used in various industrial applications including the manufacturing of fossil fuels, paint, plumbing materials, batteries, and cosmetics. Despite its beneficial industrial uses, lead has caused environmental contamination of the air, water, and soil. Recent studies conducted by US Environmental Protection Agency reported that children and pregnant women are the population most vulnerable to the toxic effects of lead exposure. Additionally, a widely cited scientific paper suggests that lead exposure during pregnancy can inversely affect fetal growth, neurological development, and cause spontaneous abortion. The present study was designed to use HL-60 cells as a test model to determine whether lead treatment induced toxicity to human leukemia cells is mediated through oxidative stress. Human leukemia (HL-60) cells were treated with different concentrations of lead nitrate for 24 hr. Live and dead cells was determined by trypan blue exclusion test and microscopic imaging. The role of oxidative stress in lead nitrate toxicity was assessed by lipid peroxidation, glutathione peroxidase (GPx) and catalase (Cat) assays, respectively. Oxidative stress biomarkers showed significant increase (p < 0.05) of malondialdehyde levels on one hand and gradual decrease of antioxidant enzyme activity (GPx & Cat) on the other hand with increasing lead nitrate concentrations. Taken together, finding from the present study demonstrates that lead nitrate treatment induced cytotoxic effects through oxidative in HL-60 cells.

R.3 Hypertension in pregnant rats with Hemolysis, Elevated Liver enzyme and Low Platelet (HELLP) Syndrome is associated with an increase in reactive oxygen species

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HELLP syndrome is associated with oxidative stress which is suspected to play a role in the hypertension and endothelial dysfunction associated with the disease. The objective of the current study was to examine a role for reactive oxygen species (ROS) in mediating the hypertension associated with HELLP syndrome. To address this objective on gestational day (GD) 12 miniosmotic pumps infusing sEndoglin (7ug/kg) and sFlt-1 (4.7ug/kg) were implanted into normal pregnant (NP) rats to induce HELLP syndrome. On GD18 carotid catheters were inserted into HELLP and NP rats and mean arterial pressure (MAP) was recorded on GD19. Rats were treated with the superoxide dismutase inhibitor (Tempol) in their drinking water to determine if blockade of oxidative stress decreased hypertension. MAP was significantly increased in HELLP rats (120.6±7.86mmHg) compared to NP rats (94.25±2.58mmHg; p=0.007). Urinary isoprostane, a marker of lipid peroxidation, was increased in HELLP rats (p=0.003) compared to NP rats. Placental NADPH oxidase stimulated ROS increased from 3421±831.2 to 6840±1175 relative light units (RLU)/min/mg in NP to HELLP rats (p=0.038). Placentas from HELLP rats also had a significant increase in total antioxidant capacity (TAC; 155.4±39.42 CRE/mg) compared to NP rats (54.07±5.09 CRE/mg; p=0.04). Administration of Tempol to HELLP rats significantly decreased MAP (p=0.04), urinary isoprostane (p=0.01) and the placental TAC (p=0.06). These data support the hypothesis that hypertension in response to anti-angiogenic imbalance is mediated in part by oxidative stress.

R.4 Population of Oligodendrocyte Precursors in White Matter of miR-21 Knock-out Mice

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Micro-RNAs are small inhibitory RNAs that reduce expression of certain proteins by interfering with mRNA translation. Micro-RNA 21 (miR-21) is particularly enriched in oligodendrocytes, and our prior research has shown a reduction in miR-21 in the white matter (WM) of human subjects with depression. MiR-21's roles in glial cells are currently unknown. We hypothesized that reduction of miR-21 could cause alterations in oligodendrocyte precursors that would be reflected in miR-21-containing mature oligodendrocytes. To test this hypothesis brain tissue sections from mice with the miR-21 gene knocked out (KO) and wild-type mice (WT) were labeled by immunohistochemistry for neuron-glia antigen 2 (NG2) and platelet-derived growth factor receptor alpha (PDGFRA), both of which are markers for oligodendrocyte precursors. The corpus callosum, the main WM bundle connecting both cerebral hemispheres, was analyzed using StereoInvestigator to quantify cell morphology and number. Analysis of the labels showed a significantly greater density of PDGFRA-expressing cells in the KO mice. There was no significant difference in NG2 expression between the KO and WT mice. These results suggest that miR-21 reduction might result in alterations in WM oligodendrocyte precursors. We speculate that reduction of miR-21 may inhibit maturation of some precursors to oligodendrocytes. The results from this research contribute to an understanding of the mechanisms by which miR-21 may be involved in glial cell pathology observed in depression and alcoholism. Future directions may include analysis of PDGFRA and NG2 cells in the white matter from humans diagnosed with depression and alcoholism and correlation with miR-21 levels.

R.5 Evaluating *Amblyomma maculatum* for the Presence of *Borrelia* spp. and other Microbiota

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The Gulf Coast tick (*Amblyomma maculatum*) is known to carry the tick-borne pathogens *Rickettsia parkeri* and *Hepatozoon americanum*. In addition, a previously undescribed *Borrelia* species was recently identified from *A. maculatum* in Mississippi and also from *A. maculatum* collected in Texas. Today, public health significance of this *Borrelia* sp. in *A. maculatum* is unknown; however, other tick-borne *Borrelia* spp. include *B. burgdorferi*, the agent of Lyme disease, and *B. hermsii*, the agent of relapsing fever. The purpose of this study was to continue to assess *A. maculatum* from Mississippi for *Borrelia* and to furthermore investigate other bacterial species in the microbiome. In this research, we used *A. maculatum* previously collected in 2015 in a nested PCR targeting the *Borrelia* spp. 16S rRNA gene. Any tick extracts that produced amplicons were processed for sequencing. For the microbiome portion of this study, we collected adult questing *A. maculatum* from Mississippi and submitted DNA extracts for microbial analysis using Illumina MiSeq. A total of 63 *A. maculatum* were tested using nested PCR. Of these, five were submitted for sequencing; all sequences were identical to *Borrelia lonestari*, which was the positive control for the PCR and likely a contaminant. We then modified our approach to perform only the primary PCR to avoid contamination and tested 32 ticks. A total of 100 ticks were collected for the microbiome assay, and 55 extracts were submitted for MiSeq analysis; results are pending. We anticipate that these data will contribute to our understanding of microbial diversity in *A. maculatum*, including rates of a *Borrelia* sp. of unknown pathogenicity.

R.6 The Incidence of Preeclampsia (PreE) in pregnant women with Human Immunodeficiency virus (HIV)

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PreE is a disease of pregnancy which is characterized by new onset of hypertension and proteinuria at 20 weeks of gestation or greater. Women with PreE also have increased levels of CD4⁺ immune cells and studies with animal models have reported that placental ischemia stimulated CD4⁺ immune cells can contribute to the development of PreE. HIV is characterized in part by a decrease in CD4⁺ immune cells. The objective of the current study was to evaluate the incidence of PreE in women with HIV. Under an Institutional Review Board approved protocol at the University of Mississippi Medical Center (UMMC) retrospective data was abstracted from medical records from women with a diagnosis code equivalent to HIV in pregnancy (spanning January 2009–December 2014). Maternal demographics, HIV viral loads, CD4 counts, ante/intra/post-partum history and neonatal birthweight and outcome were recorded. A total of 109 charts of women meeting the diagnosis code criteria have been reviewed to date, however 65 were excluded due to not delivering at UMMC which left 44 women for analysis. 10% (n=4) of these women developed PreE. These 4 women did have a nonsignificant increase in CD4 counts (542±155.9) compared to HIV women without PreE (442.2±51.37; p=0.556). HIV with PreE had been diagnosed with HIV longer than HIV women who did not develop PreE (p=0.04). Women with HIV+PreE were more at risk for developing chorioamnionitis (p<0.0001) compared to HIV patients without PreE. Women with HIV+PreE were more likely to have low birth weight babies (p<0.0001) or intrauterine fetal death (p<0.0001) compared to women with just HIV. Despite the small sample size these data suggest that the length of HIV diagnosis and increased CD4 count may contribute the development of PreE. Future directions include increasing the sample size to allow us to make more definitive conclusions.

R.7 Determining the role of glycine-rich proteins found in salivary glands of the Lone Star Tick, *Amblyomma americanum*, against host responses

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Ticks play an important ecological role as well as a growing role in human health and veterinary care. Ticks are hosts to a plethora of microbial pathogens that can be transferred during feeding to cause tick-borne diseases in humans and many animals. Ticks may in large part owe the success of the transfer of these pathogens between hosts to their complex saliva. The saliva secreted upon a tick's attachment to a host serves the following functions: anti-hemostasis of the blood pool, preventing inflammatory response at the bite site, and serving as a natural anti-microbial substance. An important component of this functional saliva is multiple Glycine Rich Proteins (GRPs). We hypothesize that the GRPs found in the saliva produced by the Lone Star Tick, *Amblyomma americanum*, are responsible for these observed functions in the saliva; therefore, the aim this research is to express and purify one particular protein, GRP 34358, to be used in further studies and assays to determine its role in anti host-response defenses. The DNA sequence corresponding to GRP 34358 was transformed into a plasmid containing a His-tag. The plasmid was then put through a restriction digestion to determine presence of the gene insert, and then sequenced to determine the orientation of the insert. The plasmid was transfected into a Vero cell line for protein expression. Once expressed, the protein will be purified in a nickel-affinity column. Expression and purification of this GRP would lead to valuable further studies of its function and structure - information that may lead to discoveries of multiple commercial uses such as a component of a biological adhesive or an anti-tick topical product.

R.8 Role of *msaABCR* operon on Antibiotic susceptibility in *Staphylococcus aureus* Biofilm

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Staphylococcus aureus strains cause severe infections among healthy individuals. Many of these infections are recalcitrant to antimicrobial therapy because of their ability to form biofilm within the host tissue and indwelling medical devices. *msaABCR* operon is a global regulator that is involved in biofilm development, antibiotic resistance and cell death in *S. aureus*. In this study we tested the impact of *msaABCR* deletion in the susceptibility of several antibiotics during biofilm formation. Deletion of *msaABCR* operon from *S. aureus* had no impact on the daptomycin, linezolid, and other antibiotics susceptibility in planktonic conditions. However, these antibiotics alone or in combination showed significant effect on biofilm formation. The MBEC assay showed statistically significant effect on the mutant's biofilm (18 fold) compared to the wild type in the presence of 40 µg/ml of daptomycin. None of the in vitro catheters colonized with WT strain were cleared even after continuous exposure of daptomycin (40 µg/ml) for 4 days, whereas the mutant's biofilm was completely cleared by day 4. Both wild type and mutant strains showed increased susceptibility to antibiotics when used in combination. The wild type strain showed 32-fold and 8-fold increased susceptibility in daptomycin and rifampicin when used in combination relative to individual use. The mutant showed an even higher increase with 80-fold for daptomycin and 16-fold for rifampicin. Similar results were observed with other antibiotics like vancomycin, linezolid in presence of rifampicin. These results showed that *msaABCR* plays important role in antibiotic susceptibility under biofilm conditions.

R.9 Exosomal microRNAs from stressed stem cells regulate gene expression in metastatic breast cancer cells.

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Exosomes (30-120nm) are made up of a double membrane of phospholipids that contain miRNA, mRNA, proteins and lipids. It has been shown that exosomes secreted by cells affect a recipient cell by modifying its protein translation, thus, inducing a cascade of signaling events. Previous studies in our lab characterized the exosomes cargo from serum deprived human mesenchymal stem cells (SD-MSCs) and their roles in tumor supportive properties. In this study, we investigated the role of exosome transferred miRNA in gene regulation of metastatic breast cancer cells. We isolated the total RNA from the tumors that were developed in mice from MDA-MB-231 cells with or without exosome treatment. Real-time PCR showed the differential expression of miRNAs 205 and 31. Furthermore, over expression of miRNAs 205 and 31 showed the down regulation of metastatic protein Ubc13 in western blotting. These findings suggests that exosomes transfer miRNAs from hMSCs may inhibit breast cancer metastatic. Further studies to identify specific factors responsible are yet to be studied.

R.10 An Investigation of Sit to Stand Ratios for Computerized Work

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Work related musculoskeletal disorders, obesity, and a variety of cardio-metabolic conditions are widespread among employees with jobs that require prolonged bouts of sedentary work. Sit-stand workstations have been developed to help alleviate monotonous positions and improve metabolism of these workers. Studies show that sit-stand workstations relieve body discomfort while maintaining efficiency, but the optimum ratio of sitting to standing is still unknown. Therefore, the purpose of this research is to quantify muscle activity and subjective discomfort while engaging in different sit-to-stand ratios when using a computer with a height adjustable desk. Additionally, the impact of using wrist supports will be quantified as body position relative to the workstation has been found to differ between the seating and standing phases of work. Two sit-to-stand times ratios will be tested: 1) 20 minutes of sitting to 10 minutes of standing (2:1), and 2) 15 minutes of sitting to 5 minutes of standing (3:1). Twenty participants will complete a 2 hour test session were they will complete a variety of computer entry tasks (email, invoice entry and processing, navigating the web). Surface electromyography (EMG) of the shoulders, neck, and upper back will be measured along with subjective perceptions of discomfort. Results of this study will be used to direct guidelines for sit-to-stand ratios for sedentary work that minimize discomfort and fatigue, while maximizing performance and productivity.

R.11 **Garlic Extract Induces Toxicity to Human Leukemia (HL-60) Cells through Oxidative Stress**

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Garlic supplementation in diet has been shown to be beneficial to cancer patients. Recently, its pharmacological role in the prevention and treatment of cancer has received increasing attention. However, the mechanisms by which garlic extract induces cytotoxic effects in cancer cells remain largely unknown. The present study was designed to use HL-60 cells as a test model to determine whether garlic treatment induced toxicity to human leukemia cells is mediated through oxidative stress. Human leukemia (HL-60) cells were treated with different concentrations of garlic extract for 24 hr. Live and dead cells were determined by trypan blue exclusion test and microscopic imaging. The role of oxidative stress in garlic toxicity was assessed by lipid peroxidation, glutathione peroxidase (GPx) and catalase (Cat) assays, respectively. Oxidative stress biomarkers showed significant increase ($p < 0.05$) of malondialdehyde levels on one hand and gradual decrease of antioxidant enzyme activity (GPx & Cat) on the other hand with increasing garlic doses. Taken together, finding from the present study demonstrates that at therapeutic concentrations, garlic treatment induced cytotoxic effects through oxidative in HL-60 cells.

R.12 **The Effects of LPS on A549 Cell Function and Viability**

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The cell line A549 is a continuously cultured line derived from a human pulmonary adenocarcinoma that has morphologic and biochemical features of the pulmonary alveolar type II cell. The type II cells secrete surfactants and modulate lung immunity. The goal of the experiment was to challenge A549 type II cells with low (2 ng/mL), medium (5 ng/mL), or high (10 ng/mL) doses of LPS and to determine the effects on cell function and survival over 24, 48, and 72 hours. Cell protein concentrations and cell numbers were decreased at 48 and 72 hours in the medium and high LPS treated groups when compared to non-treated control cells. No noticeable differences were observed in the glutathione or nitric oxide measurements after 24 hours, but there was an increase in nitric oxide following the challenge with LPS after 48 hours. Cellular morphology showed evidence of hydropic swelling after 24 hours and was still evident after 72 hours in LPS treated cells. The cells did not show increased evidence of karyohexis and karyolysis after 48 and 72 hours. After 72 hours there was an increase in the number of anucleated cells in the medium and high dose LPS treatments when compared to control.

R.13 Quantum Mechanical Investigations of Mechanophores*Logan James¹, Guido Todde², Yoan C. Simon², Gopinath Subramanian^{2*}*¹ *Mississippi INBRE Research Scholar, Mississippi State University, Mississippi State, MS*² *School of Polymers and High Performance Materials, The University of Southern Mississippi, Hattiesburg, MS*

Mechanochemistry is the study of the effect of mechanical energy on chemistry. It can be described as the study of the “wear and tear” on objects or certain molecules. A dithiomaleimide (DTM) and a sulfonate ester were tested in this study. DTM is a highly fluorescent molecule that has been used to tag proteins, while sulfonate esters are known in organic chemistry as excellent leaving groups. The purpose of the study was to determine the maximum force that a particular bond in the molecule can endure. We used a Nudged Elastic Band (NEB) method to calculate the energy barriers for bond breakage as a function of external mechanical forces. For DTM, we hypothesized that 50 piconewtons would be the maximum force the molecule could withstand. After further testing, 35 piconewtons proved to be the maximum force that DTM could withstand. We also concluded that higher force values cause lower activation energies. Preliminary studies on sulfonate ester show similar trends.

R.14 Exposure of Prepared Silver-Nanoparticles to A549 Cells in Culture*Markiesha James¹, Austin Puckett², Gerri Wilson², Shareena Dasari³, Denise Yancey³, Hongtao Yu³, Michelle Tucci^{2*}, and Hamed Benghuzzi^{4*}*¹ *Mississippi INBRE Research Scholar, Jackson State University, Jackson, MS*² *Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS*³ *Jackson State University, Jackson, MS*⁴ *Department of Diagnostic and Clinical Laboratory Sciences, The University of Mississippi Medical Center, Jackson, MS*

The field of nanotechnology has grown rapidly over the past few years, and silver nanoparticles (AgNPs) have garnered significant interest in terms of their potential physical and clinical applications. Silver nanoparticles have been used in paints, in artificial prosthetic devices, and as drug delivery devices. With the use of AgNPs in many clinical conditions, potential toxicity remains a concern. Hypersensitivity reactions have been reported in a small proportion of burn patients who received ionic silver treatment, and a limited number of cell culture studies have also shown some evidence of nanoparticles being harmful. The toxicity appeared to be inversely related to particle size. The goal of this study was to determine how the concentrations of AgNPs affects the A549 cell line’s functions and morphology over time. Silver nanoparticles were prepared and ranged in size from x to x. The AgNPs were diluted to a stock concentration of xx in culture media. A549 cells were grown in 24-well plates and on coverslips and treated with low (0.1 μM), medium (1 μM), or high (10 μM) concentrations of AgNPs for 24, 48, and 72 hours. The cells were harvested at each time point, and cell numbers, protein, nitric oxide, and glutathione concentrations were determined. Cells grown on coverslips were stained with hematoxylin and eosin and evaluated for morphological changes. All results were compared with cells in media alone. The results show no differences in cellular protein concentrations for the duration of the study. After 24 hours in culture, there was a significant increase in nitric oxide, which was observed in all treatment groups with the lowest dose having the greatest response. After 48 hours in culture, a dose-dependent decrease in intracellular concentrations of reduced glutathione was observed. Morphological changes were also evident in all treatment groups after 24 hours. Hydropic swelling was evident in all treated groups with the lowest dose treatment having the largest percentage of cells displaying this characteristic. By 72 hours the cells appeared similar to control and displayed less cell lysis at the higher dose treatments. Overall, the AgNPs were endocytosed and highly aggregated inside vesicular structures with increased changes in both cellular nitric oxide and hydropic swelling within the first 24 hours. However, additional time points show a cellular recovery and lack of cytotoxicity at the concentrations tested.

R.15 Activity of Plant-Derived Antimicrobial Compounds against Antibiotic Resistant Pathogens

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Each year in the United States over 2 million people become ill, and 23,000 people die as a result of infections caused by antibiotic-resistant pathogens. These infections are a major health concern because bacteria constantly evolve new mechanisms to resist antibiotics, thus making the number of effective drugs rapidly decline. Hence, there is a need for novel therapeutic measures against antibiotic-resistant bacteria. Plant-derived antimicrobial compounds have emerged as a promising alternative to medical antibiotics but detailed knowledge about their mode of action against antibiotic-resistant pathogens is lacking. In this study, we screened plant-derived antimicrobials vanillin, carvacrol, and thymol, as well as butyl paraben, chlorobenzaldehyde, and methoxybenzaldehyde for the ability to antagonize different strains of *Staphylococcus*, *Burkholderia*, *Escherichia*, *Mycobacterium*, and *Pseudomonas*. We used an overlay assay to determine the activity of individual compounds and broth microdilution method to define their Minimal Inhibitory Concentration (MIC). Our results revealed that each compound inhibited at least six pathogens, and the MIC assay showed that carvacrol and vanillin were the most active compounds, as they inhibited 100% of all tested pathogens at low concentrations. We are currently working on determining the synergistic effect of different compounds to increase their efficacy. We also plan to incorporate the most active compounds into polymer nano-particles to improve their stability and sustained delivery.

R.16 Interleukin-1 receptor antagonist reduces lipopolysaccharide-induced brain injury and improves neurobehavioral performance in neonatal rats

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Inflammation plays an important role in brain injury in neonatal human and animal models. Our previous study indicated that neonatal lipopolysaccharide (LPS) exposure resulted in brain inflammation, as indicated by sustained activation of microglia and elevation of interleukin-1beta levels in the brain. The objective of our current study was to examine whether the IL-1 receptor antagonist (IL-1ra) reduces systemic LPS-induced brain inflammation, brain damage, and neurological dysfunction. Intraperitoneal (i.p.) injection of LPS (2 mg/kg) was performed in P5 Sprague-Dawley rat pups and IL-1ra (100 mg/kg) or vehicle was administered (i.p.) 5 min after LPS injection. The control rats were injected (i.p.) with sterile saline. Neurobehavioral tests were performed and brain injury was examined on P6. Our results showed that IL-1ra protected against LPS-induced neurobehavioral impairments, including reduction of mean latency times in wire hanging maneuver and hind-limb suspension. IL-1ra treatment also provided protection against LPS-induced brain damage, as indicated by loss of oligodendrocytes. IL-1ra also significantly attenuated LPS-induced increment in the number of activated microglia and concentration of IL-1beta in the neonatal rat brain and serum. In summary, our data suggests that due to its potent anti-inflammatory property, IL-1ra may protect developing brain against systemic LPS exposure-induced brain injury and neurobehavioral disturbance.

R.17 Early Life REM Sleep Deprivation Affects Learning Abilities in Young RatsAlana Knowles¹, James P. Shaffery^{2*}, Sorsha Morris³, Amanda Blackwell⁴¹Mississippi INBRE Research Scholar, East Central Community College, Decatur, MS²Department of Psychiatry, The University of Mississippi Medical Center, Jackson, MS

Rapid Eye Movement (REM) sleep is imperative to all human life as many chemicals and hormones follow a circadian release in the body during that time. In a previous electrophysiological study conducted by Dr. James P. Shaffery, physiological changes were discovered in the hippocampus of sleep deprived subjects. We are furthering the research that REM sleep deprivation on young rats can affect brain maturation and brain development as they age, by examining learning behavior affected by changes in the hippocampus. To test this hypothesis, we ran sleep deprivation on immature rats 4 hours a day for four days straight. We will test the rats against controls with several tests: play behavior, novel object recognition, open field tests, adult ultrasonic vocalizations, novel place recognition, and novel object response, to gauge how their behavior, memory, and learning abilities were impacted by the REM sleep deprivation (REMSD). We predict that the experimental rats will display abnormal memory and behavioral changes in comparison to non-REMSD rats. If this hypothesis is supported by pending results, it will demonstrate how sleep deprivation on children and young adults can be detrimental to their learning behavior.

R.18 Characterization of the *Escherichia coli* proteins YfDU, YfdU and YfdXBreanna Lewis¹ and Cory G. Toyota, Ph.D.^{2*}¹Mississippi INBRE Research Scholar, Tougaloo College, Tougaloo, MS²Department of Chemistry and Biochemistry, Millsaps College, Jackson, MS

Recent studies show that kidney stone formation is due to the increased oxalate in the blood. Oxalate is a small-chain organic acid which induces a moderate acid response in *Escherichia coli* K-12. Scientists believe that the occurrence of *Oxalobacter formigenes* plays a key role in mediating mammalian homeostasis. *Oxalobacter formigenes* is an obligate anaerobe that colonizes the human gastrointestinal tract and encourages oxalate as a source of energy and carbon for cellular biosynthesis. The significant genes we are observing are YfdX, YfdW, and YfdU these genes encode proteins that are required for oxalate to induce acid tolerance in *E. coli*. YfdW and YfdU genes are homologous to proteins present in *O. formigenes*. If *Oxalobacter* is present then it can mediate the conversion of oxalate into formate and CO₂ in a coupled catalytic cycle which will lower the oxalate in blood and lessen the chance of kidney stone formation. In the lab, we're working on cloning DNA fragments into a plasmid vector. Ultimately, our goal is to comprehend if YfdW and YfdU are able to stick together and be inserted into a specific site on a vector. Currently, the research is still in development and results are proceeding.

R.19 Quantitative analysis of retrograde signaling in select Rtg2p mutants of *S. cerevisiae*
*Lydia Nunes*¹, *Jian Jiang*², and *Donna M. Gordon*^{2*}

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In the budding yeast *Saccharomyces cerevisiae*, dysfunctional mitochondria can initiate a mitochondria-to-nuclear signaling cascade known as retrograde signaling. This pathway offers a means to compensate for mitochondrial deficiencies by initiating the transcriptional upregulation of select genes, such as *CIT2*. *CIT2* codes for a peroxisomal isoform of citrate synthase and is transcribed at an elevated level in cells with mitochondrial defects. *CIT2* expression is regulated by the activity of several cytosolic proteins including Mks1p, Rtg1p, Rtg2p, and Rtg3p. Rtg2p functions as the cytosolic sensor that, when bound to Mks1p, allows the Rtg1p/3p complex to enter into the nucleus. Nuclear localized Rtg1p/3p then functions as a transcriptional activator, binding to a conserved DNA sequence found in the promoter of select genes including *CIT2* and *ACO1*. Using a random chemical mutagenesis approach, our lab has generated four *RTG2* mutants that each contain a single amino acid change that results in reduced retrograde signaling. To expand on the qualitative differences in Rtg2p signaling function identified through the use of growth on selective plates, quantitative data will be obtained using classic promoter driven β -galactosidase liquid expression assays. For these studies, the β -galactosidase gene, *lacZ*, will be placed under the *CIT2* promoter in strains that express each of the Rtg2p mutations. Cells will be grown in non-inducing (+ glutamate) and inducing (-glutamate) conditions and the impact of each mutation on Rtg1p/3p transcription will be quantified. The resulting β -galactosidase activity will be normalized to the wild-type Rtg2p expressing strain under non-inducing conditions. Differences in transcriptional activities will be confirmed by real-time PCR targeting known retrograde signaling transcripts.

R.20 Validation of a Chemogenetic Approach to Specifically Modulate the Activity of Mesolimbic Dopaminergic Neurons in the Rat

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Reward-related behavior is largely mediated by the mesolimbic dopaminergic pathway that originates in the midbrain ventral tegmental area (VTA). The VTA is comprised of multiple cell types, thus experimental stimulations of this region are typically non-specific. Here, we validate the use a Designer Receptor Exclusively Activated by a Designer Drug (DREADD) approach to specifically excite VTA dopamine (DA) neurons. Viral-mediated transfection of transgenic tyrosine hydroxylase::Cre rats was used to induce the expression of an excitatory DREADD receptor (AAV5-DIO-hM3D[Gq]-mCherry) in VTA DA cells. To confirm specific activation of these neurons, the effects of clozapine-N-oxide (CNO) administration on conditioned place preference behavior, locomotor activity, and cFos expression were examined at two times of day (zeitgeber time [ZT]11 and 23). Immunohistochemical analyses revealed specific expression of the DREADD receptor in DA neurons that was confined to the VTA region. Systemic CNO administration significantly induced a conditioned place preference at ZT11 but not at ZT23. In contrast, CNO administration significantly induced locomotor activity and VTA c-Fos expression at both times of day examined. CNO administration did not significantly affect these parameters in animals with misplaced viral injections. These results demonstrate that a chemogenetic approach can be used to specifically modulate the activity of mesolimbic dopaminergic neurons and suggest that time-of-day is an important factor to consider with these manipulations.

R.21 High rate and Quasi-Static Investigation of Porcine Brain Tissue*Timothy S. Pace¹, H. Johnson², C. White², Lakiesha N. Williams, Ph.D.^{2*}*¹Mississippi INBRE Research Scholar, East Mississippi Community College, Scooba, MS²Department of Agricultural & Biological Engineering, Mississippi State University, Mississippi State, MS

According to the Center for Disease Control, more than 5.3 million people currently living with a disability caused by traumatic brain injury (TBI). By studying the response of brain tissue at varying strain rates, the severity of TBI can be evaluated by analyzing the mechanics and microstructure of the tissue. A better understanding of the tissue deformation at different strain rates will allow for more ways to help prevent and treat future TBI cases. Porcine models were obtained from a local abattoir and the samples were extracted within the first hour of acquisition. Testing was performed at both quasi-static and high strain rates using the Mach-1 Micromechanical System and the Split-Hopkinson Pressure Bar (SHPB) method utilizing a polymeric bar. Quasi-static tests were conducted at rates of 0.00625, 0.025, and 0.1 s⁻¹, while the SHPB tests were conducted at 280, 330, and 390 s⁻¹. Quasi-static testing is still in progress. However, sufficient data has been acquired from SHPB testing. The SHPB data shows that increasing strain rates cause the brain to undergo an extreme hardening effect due to its viscoelastic properties. This higher strain rate results in much higher maximum stresses compared to those of the quasi-static tests. Further evaluation of brain microstructure will be explored to compare the damage that occurs from the different strain rates.

R.22 Florescent Imaging of Calcified Vascular Smooth Muscle Cells*Phenique Parker¹, Ursula Offiah², C. LaShan Simpson, Ph.D.^{2*}*¹Mississippi INBRE Research Scholar, Mississippi State University, Mississippi State, MS²Department of Agricultural & Biological Engineering, Mississippi State University, Mississippi State, MS

Vascular calcification occurs when large deposits of calcium mineral accumulate in the vascular arterial walls and obstruct blood flow. The smooth muscles cells of the arteries develop into osteoblasts and the calcification can lead to serious diseases such as cardiovascular disease and chronic kidney disease. In medical research today, scientists are investigating therapies that can reverse and inhibit calcification. By researching therapies for prevention, elevated calcium and phosphate levels must be observed at various aspects in order to examine the transformation of smooth muscle cells to osteoblasts. The fluorescent stain, Xylenol orange easily stains calcium mineral and could differentiate newly formed osteoblast-like cells from the smooth muscle cells. Cells will be grown in a calcification media containing dibasic sodium phosphate, which induces calcification. The Xylenol orange fluorescent stain will then be used to identify mineral deposits. The stain will make it clear where the calcification is located in the cell culture, as well as how quickly the transformation occurs once the calcification media is added. In the future, the detection of the mineralization using Xylenol orange will be used to determine alternative markers that will signal the transformation of smooth muscle cells into osteoblasts. Various fluorescent stains such as Calcein blue can be used to observe the transformation. Once the studies have been conducted on the mineralization and transformation of the smooth muscle cells, the staining will be used as an efficient indicator of various therapies that will reduce calcification effectively.

R.23 Elucidating Structure in the Early Stages of Aggregation in Elastin-Like Proteins*Geoffrey Pratt*¹, *Yue Zhang*², *Nicholas Fitzkee*^{2*}¹ *Mississippi INBRE Research Scholar, Northeast Mississippi Community College, Booneville, MS*² *Department of Chemistry, Mississippi State University, Mississippi State, MS*

Elastin-Like Proteins (ELPs) have been proposed as a novel drug delivery vector for treating cancer. These proteins aggregate reversibly above a specific temperature, allowing ELPs to be thermally targeted to cancerous tumors. Though proven successful in mouse models, without a molecular understanding of how ELPs aggregate, it remains extremely difficult to optimize these molecules for drug delivery in humans. Our hypothesis is that ELPs have a close interaction between the amino- and carboxy-termini in the ELPs aggregated phase. Using dynamic light scattering, Electron Paramagnetic Resonance (EPR) and multi-dimensional Nuclear Magnetic Resonance (NMR) we have begun characterization of the temperature dependent transition in our ELPs. In addition, we have labeled our protein using MTSL, a paramagnetic spin label that allows us to monitor protein association at a genetically specified cysteine location. Our dynamic light scattering experiments confirm that aggregation is occurring on the macromolecular scale for each variant. Preliminary EPR results indicate that the protein termini are associating at the early stages of aggregation. This is supported by the observation that the EPR spectra of a mixture of terminal cysteine-MTSL variants A4C+A4C, T204C+T204C, and A4C+T204C each possess an additional peak by which Markham *et al.* state is indicative of electronic dipolar interactions. Other mixtures of variants including T44C+A84C, and A84C+A84C do not show this additional peak. In the near future we intend to complete EPR and NMR experiments on every mixture of variants, and draw conclusions based on these results.

R.24 *Vibrio vulnificus* and the Mississippi Gulf Coast*Madison Pullens*¹ and *Jay Grimes*^{2*}¹ *Mississippi INBRE Research Scholar, Mississippi Gulf Coast Community College, Jefferson Davis Campus, Gulfport, MS*² *Department of Biological Sciences, The University of Southern Mississippi, Hattiesburg, MS*

All along the Mississippi Gulf Coast, a detrimental strand of *Vibrio* is causing havoc upon the economy. Rejection of seafood and deterioration of tourism is just the start in these towns fiscal problems. *Vibrio vulnificus*, a halophilic Gram-negative bacteria, is naturally in marine environments and is thriving in the coastal waters. It branches into two biotypes, Serovar A: an ecological strain and Serovar B: a clinical strain. The clinical strain has been labeled as "Flesh Eating Bacteria" due to the two main syndromes it possesses. Septicemia, the deadliest food-borne disease, accounts for 95% of seafood related deaths and has a 50% mortality rate. Wound infections account for a 25% mortality rate but often end in amputation even though it can be treated with inexpensive antibiotic therapy. *V. vulnificus* presents seasonal infections with an 85% rate of infection occurring between May-October. This has a positive correlation with the warm water temperature possessed in the Mississippi Sound that attracts many tourists to the beach along with the flourishing filter feeding oysters.

R.25 Post-partum rats with a history of Hemolysis, Elevated Liver enzyme and Low Platelet (HELLP) Syndrome have evidence of hepatic inflammation and hypertension during the early post-partum period

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Women with a history of HELLP syndrome during pregnancy are reported to be at an increased risk of developing cardiovascular and immune related diseases compared to women with normal pregnancies. Therefore the objective of this study was to determine if rats with a history of HELLP syndrome had increased immune activation and hypertension in the early post-partum period. On gestational day 12, mini-osmotic pumps infusing sFlt-1 and sEng are placed into rats to induce HELLP syndrome and were removed 12-24hrs post-delivery. Mean arterial pressure (MAP) was measured during postpartum days 33-40 and blood and tissue were collected to measure inflammatory cytokines via enzyme linked immunoassay (ELISAs; R&D Systems) and immune cells via flow cytometry. Rats with a history of HELLP syndrome had significantly increased MAP compared to NP rats ($p=0.022$). There were no statistically significant differences in circulating levels of sFlt-1 ($p=0.44$) or sEng ($p=0.83$) or in circulating levels of IL-6 ($p=0.44$), TNF α ($p=0.90$) or IL-1 β ($p=0.07$) between NP and HELLP rats. Local levels of the anti-angiogenic factor sFlt-1 in the liver were significantly increased in HELLP rats compared to NP rats ($p=0.02$). sEng levels were increased in HELLP rats compared to NP rats but did not meet statistical significance ($p=0.08$). Liver levels of the inflammatory cytokines IL-6 and IL-1 β were significantly increased in HELLP rats compared to NP rats ($p=0.04$, $p=0.04$). Whereas, TNF α levels were not different between the groups ($p=0.11$). CD4 and CD8 immune cells were collected for flow cytometric analysis and results are pending. These data suggest that rats with a history of HELLP syndrome are hypertensive in the early post-partum period of time and have increased hepatic inflammation.

R.26 The Effects of Triamcinolone Acetonide on A549 Cells

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Inhaled corticosteroids are widely used for the treatment of patients with inflammatory lung disorders including asthma, chronic obstructive pulmonary disease, and sarcoidosis. Corticosteroids effectively reduce the production of inflammatory mediators such as cytokines and chemokines. Although these molecules are also essential for host defense responses, there is little data on their effects on type II pneumocytes. In this study A549 type II pneumocytes were challenged with low (5 $\mu\text{g/mL}$), medium (25 $\mu\text{g/mL}$), or high (50 $\mu\text{g/mL}$) triamcinolone acetonide (TA) for 24, 48, and 72 hours. Cellular protein levels were not affected at 24 and 48 hours following treatment with TA when compared to control untreated cells. Cellular protein levels showed a significant reduction after 72 hours following treatment with all doses of TA when compared to control cells. There were no apparent changes in reduced intracellular glutathione content at any time point. A decrease in nitric oxide was seen by 24 hours and remained suppressed after 48 hours. Morphological assessment of the cells indicated an increase in the number of karyolytic cells by 48 hours in all TA treated cells when compared to control untreated cells. After 72 hours, an increase in the number of cells with features consistent with karyohexis was observed. There also appeared to be a dose-dependent increase in the number of pyknotic cells when compared with control untreated cells. Overall, the data shows that increased concentrations of TA have adverse effects on type II pneumocytes, which is important information because an intact pulmonary surfactant system is necessary for normal respiratory function. More importantly, asthmatic patients have been shown to have alterations in surfactant production, which contributes to the pathogenesis of the disease process. Our data suggest that increasing doses of TA may increase the loss of the surfactant producing cells and further impair the respiratory function.

R.27 Growth phase dependent sensitivity of *C. albicans* to the novel antifungal occidiofungin
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There has been a major push to educate the public, and physicians alike to the present and future dangers of antibiotic resistant bacteria. However, the potential for resistance to the current first-line antifungals is just as real. Several fungal species (e.g. *Aspergillus* and *Candida*) no longer respond to the antifungal treatments currently being used. This emerging phenomenon is known as antifungal resistance, and it is of considerable concern when treating invasive infections. The aim of this project was to build upon the current findings related to the characterization of the novel antifungal occidiofungin with the goal of better understanding its mechanism of action against *C. albicans*. Occidiofungin is a cyclic glycolipopeptide that was isolated from the Gram-negative bacteria, *Burkholderia contaminans*. Unlike the current antifungals compounds, occidiofungin does not bind to ergosterol, inhibit the activity of enzymes involved in ergosterol biosynthesis, or target glucan synthase. Through an unknown mechanism, occidiofungin has been shown to induce an apoptotic death. Previous work in the lab using the nonpathogenic yeast *Saccharomyces cerevisiae*, had shown that cells that had entered quiescence were resistant to the fungicidal activity of occidiofungin. This present research aims to extend these findings into the pathogenic fungi *C. albicans*. Although *C. albicans* have not been shown to have a quiescent stage of growth, after 2 days of growth in liquid cultures, *C. albicans* acquires both thermotolerance and resistance to hydrogen peroxide stress, both hallmarks of a quiescent state for *S. cerevisiae*. The sensitivity of these cells to occidiofungin will be determined using both spotting assays and colony forming unit (CFU) measurements. By identifying cellular pathways and environmental condition that result in altered sensitivity to occidiofungin, potential pathways of resistance to this antifungal can be identified.

R.28 The Effects of a Volatile Anesthetic Agent and LPS on A549 Cells

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Inhaled anesthetics are fairly common all over the world for minor and extensive surgical procedures in patients of all age groups. Volatile anesthetics, besides their anesthetic effects, have significant non-anesthetic physiologic effects. Volatile anesthetics have been shown to exhibit anti-inflammatory effects in the lungs. The mechanisms of organ protection by volatile anesthetics are unclear. This study evaluated the response of A549 cells to a 30 minute exposure with isoflurane followed by a challenge with either low (2 ng/mL), medium (5 ng/mL), or high (10 ng/mL) dose of an inflammatory agent, LPS. Cell viability markers (protein concentration and cell number), cell function markers (intracellular glutathione and nitric oxide production), and cell morphology were evaluated after 24, 48, and 72 hours. Cell number and cellular protein concentrations were similar for the duration of the experiment. Cellular glutathione was increased in all cells treated with LPS at 24, 48, and 72 hours compared to the isoflurane control. Interestingly, the nitric oxide response was lower in LPS treated cells after 48 hours when compared to isoflurane control, which suggests that the inflammatory response was attenuated. Cell morphology was also evaluated, and our results showed an increase in the number of anucleated cells in the medium and high treated groups after 24 hours. Hydropic swelling, karyolysis, and karyohexis at 24, 48, and 72 hours were not different from isoflurane-only treated cells. Overall, LPS following isoflurane treatment did not increase cell damage or decrease cell viability. Isoflurane appeared to reduce the pro-inflammatory nitric oxide response, which is often associated with acute lung damage.

R.29 Using SERS Assay to Detect Dengue Virus Serotype 2*E. Ashley Thompson*¹, *Amber Paul*², *Fengwei Bai*^{2*}¹ *Mississippi INBRE Research Scholar, The University of Southern Mississippi, Hattiesburg, MS*² *Department of Biological Sciences, The University of Southern Mississippi, Hattiesburg, MS*

Dengue Virus (DENV) is a flavivirus spread by mosquitoes that is endemic in the tropic and subtropic climates. It is the causative pathogen of Dengue Fever, Dengue Hemorrhagic Fever, and Dengue Shock Syndrome, and has been classified as a reemerging pathogen. There have been several reports of the virus being spread via blood transfusions. Due to the expense on expertise needed to run in-field tests like ELISA and rapid detection tests (RDT), as well as the variable percentage of correct results, we developed a system of detection using the surface-enhanced Raman spectroscopy (SERS) with gold nanoparticles to detect DENV and West Nile Virus (WNV). After the promising results of the SERS application and further research into the specificity of the assay, we hypothesized that SERS could be used to distinguish between four different serotypes of DENV. To test this, specific antibodies for DENV 2 were produced from the HB46-ATCC cell line and collected from the medium of the cell line. Using HiTrap™ Protein G HP columns, the antibodies were purified from the medium. Concentration was performed via SpinX centrifuge filters, after which the concentration was measured by Bradford assay. SDS-PAGE confirmed no protein contamination, and immunostaining confirmed antibody specificity for DENV 2. Jackson State University is providing the gold nanoparticles, and due to the lack of those particles for the moment, only the antibody work was confirmed.

R.30 Degree of Crosslinking*Jaylyn Walker*¹ and *Steve Elder*^{2*}¹ *Mississippi INBRE Research Scholar, Hinds Community College, Raymond, MS*² *Department of Agricultural and Biological Engineering, Mississippi State University, Mississippi State, MS*

The purpose of the research is to determine the effects of treatment on Epigallocatechin Gallates (EGCG), and Genipins degree of crosslinking, as well as to achieve concentration to 30-60-90% degree of crosslinking. Researchers speculate that using acellular osteochondral xenografts are a better alternative than allografts for the repairing of focal articular cartilage lesions in the knee. To make a xenograft resistant to chronic immune responses of the body, researchers must stabilize the xenograft through crosslinking the cartilage. The study uses Genipin and EGCG to crosslink decellularized porcine articular cartilage plugs or discs. Genipin is a chemical compound found in gardenia fruit extract, and Epigallocatechin Gallate is a compound found in many dietary supplements as well as dried leaves of white tea, green tea and, in smaller quantities of black tea. The methods used for the study started off by harvesting plugs and discs from the stifle joints of pigs, the collected discs/plugs are then washed and frozen for preparation for the Genipin and EGCG solution. Plugs/discs are then placed in both solutions to incubate at 37°C for a duration of 24 to 72 hours where they then turn red (EGCG) and blue (Genipin). Plugs/discs are washed in water after which a ninhydrin assay is run to determine the amount of free amino groups in uncrosslinked controls and experimental discs/plugs. The results of this research could be used to develop a new treatment alternative for localized articular cartilage injuries in the knee.

R.31 The Effects of Isoflurane and Triamcinolone Acetonide on A549 Cells

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The integrity of the lung alveolar epithelial barrier is required for gas exchange and is important for immune regulation. Alveolar epithelial barrier is composed of flat type I cells, which make up approximately 95% of the gas-exchange surface, and cuboidal type II cells, which secrete surfactants and modulate lung immunity. The goal of the experiment was to evaluate the effects of isoflurane treatment on type II pneumocytes that were subsequently treated with low (5 µg/mL), medium (25 µg/mL), or high (50 µg/mL) triamcinolone acetonide (TA) for 24, 48, and 72 hours. The results show a decrease in cell number in all treated groups after 48 hours. High dose treatment showed the largest decline (50%) when compared with isoflurane treatment alone. At 72 hours after treatment, TA treated groups had significant reduction in cell numbers. Intracellular glutathione content was not statistically different in the TA treated groups compared with the isoflurane treatment alone for the duration of the experiment. Nitric oxide showed a significant decline after 48 hours in all TA treated groups when compared with isoflurane-only treated cells. Cellular morphological changes were also evident by 24 hours in the TA + isoflurane treated groups when compared to isoflurane-only treatment. There was a dose-dependent increase in the number of karyolytic and pyknotic cells. Overall, the data suggest that increases in TA administration following isoflurane exposure cause alterations in cell morphology by 24 hours and reductions in cell numbers by 48 hours. The data also suggest an increase in cell loss as the dose of TA increases.

R.32 Development of a Mild Autoimmune Disease Model for Evaluation of Effects of Cannabidiol (CBD)

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Cannabinoids, including the non-psychoactive compound, cannabidiol (CBD), are known immune suppressors and are being investigated as treatments for autoimmune disorders. Multiple sclerosis (MS) is one autoimmune disease in which the immune system attacks cells in the central nervous system (CNS) that provide neuronal myelination, and CBD has potential for decreasing spasticity in MS. We used a mouse model for MS, experimental autoimmune encephalomyelitis (EAE), in order to determine effects and mechanisms of CBD in EAE. Previous results from *in vitro* studies demonstrated that CBD differentially regulated cytokine production depending on the strength of T cell activation, so our goal was to induce EAE with two different amounts of a self-antigen in order to determine if CBD also differentially altered EAE disease. Thus, EAE and "low EAE" were induced with 100 µg or 20 µg of the self-peptide, myelin oligodendrocyte glycoprotein (MOG₃₅₋₅₅), respectively. We hypothesized that CBD would also differentially affect EAE and low EAE, with CBD attenuating EAE and CBD enhancing low EAE. In EAE, clinical scores were delayed by CBD by 2 days, and low EAE, clinical scores were delayed entirely. At necropsy, splenocytes (SPLC) and lymph nodes (LN) were stimulated with MOG or MOG plus 3/28 beads. CBD did not produce a significant effect on either IL-17A or IFN-γ production in response to EAE or low EAE as assessed by ELISA. Intracellular IL-17A and IFN-γ were also assessed by flow cytometry and the only effect was that CBD slightly decreased IFN-γ production from splenic CD4+ cells and LN-derived CD8+ cells in both EAE and low EAE disease states. Overall, the data demonstrate that a milder disease course was induced with the lower dose of self antigen, but CBD attenuated disease regardless of disease state. The attenuation of disease might involve modest effects on IFN-γ production in peripheral T cells. However, there are likely other factors, either immune responses in the CNS, or direct attenuation of neuronal demyelination, that account for CBD's effectiveness in EAE.

Mississippi INBRE Service Scholars (MISS)

S.1 The Associations Between Childhood Sexual Abuse, Depression and Social Support Among Black Men Who Have Sex with Men (BMSM): The MARI Study

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Early life childhood sexual abuse (CSA) has been linked as a stressor during adolescent and post-adolescent life and associated with psychological and physiological effects. CSA has been found to be linked to depression and HIV infection, but no link has been found between CSA, depression, and social support in BMSM. This study was conducted to determine if there is an association between CSA, depression and social support in BMSM in the Jackson and Atlanta area. 356 BMSM participated for this study. These participants were from the Atlanta and Jackson area. These participants were surveyed with two scales; the first being a survey on their current depressive state and the other was a scale to determine if they had experienced CSA. Both of these scales asked questions that ranged from little or none at all to very often. Of the 356 participants who took part in this study 67% of them identified as gay/homosexual. Out of these participants 52% of them were surveyed to have had Childhood Sexual Abuse. There is also a significant difference in those who knew that they were HIV diagnosed with CSA than those who did not have CSA in the Jackson area by 16%. Finally, we found in this study no significant difference in social support in BMSM with CSA than those without CSA. With this data we can show that BMSM are directly affected by CSA in regards to HIV infection and depression rates. This shows we should start to focus some attention to those are directly affected by CSA to decrease risk HIV and depression rates in BMSM in the deep south metropolitan areas. Our data did not support a correlation between those with CSA and those without CSA having a significant difference in social support. While our study does not support this other studies may have found different findings.

S.2 The Effectiveness of HIV/STI Prevention Intervention(s) for African-American Teen Girls.

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Human Immunodeficiency Virus (HIV), primarily African American women. African American women receive more AIDS diagnoses and experience more HIV-related deaths than any other racial or ethnic group in the U.S. In 2003, black teens (ages 13-19) comprised of 66% of AIDS cases, while white teens counted for 11% of AIDS cases. We used data from Sisters Informing, Healing, Living, and Empowering (SiHLE) to determine if the intervention is an effective method of reducing risky sexual behaviors among African-American teenage girls. Participants were given a Pre and Post assessment which asked questions concerning 1) risky sexual behaviors and 2) perceptions regarding condom usage. Descriptive statistics were conducted and the results were analyzed. Results show a positive increase in condom usage among teens between themselves and their partners. Results show a decrease in females with their belief that condom usage builds trust among them and their partners. Also, we see an increase with women and the notion of sex not feeling good with a condom. Interventions can be useful for girls in Mississippi as long as there can be adequate resources and helpful methods along the way. By doing the SiHLE information teen girls will increase and that in part will also increase the awareness from girls with having safe sex. As long as there is a common understanding between them and their partners, safe sex can be useful in stopping the trend of unprotected sex and the many health effects associated with it.

S.3 How does The Service Scholars Program prepare students for careers in the biomedical/public health sector in order to diminish the health disparity gap?

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The Service Scholars Program aims to attract, train and mentor students. The program consists of a summer intensive experience designed to provide students with the tools needed to diminish the health disparity gap through connecting public health practices and biomedical research. Students are placed with "My Brother's Keeper, Inc.," out of Jackson, MS., an organization designed to enhance the health and well-being of minorities through leadership, collaboration, and partnerships in public and community health practices. The two-week orientation is an academic experience designed to expose students to public health and its core public health competencies. An intensive 8-week professional workforce experience follows the two-week orientation specific public health projects or activities, as proposed by the assigned mentor. Our study utilized pre/post public health knowledge assessments, entry & exit surveys and qualitative feedback from various surveys to evaluate the Service Scholar Program's process of preparing the students. Year 2014, assessment scores show 80.25% correct for Pre-test and 81.67% for Post-test. Cohort for year 2015, scored 73.97% correct for Pre-test and 74.69% for Post-test. Due to improper care of 2014 and 2015 data, the effectiveness of the Service Scholars program could not be clearly measured from assessment scores. Pertinent tasks to evaluating the benefits would include, but not limited to: continuation of pre/post test, entry & exit surveys, strategic guidelines for data collection, three month follow-ups, and capacity interventions.

S.4 Childhood Sexual Abuse among Black Men who have Sex with Men (MSM): The MARI Study

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Scant research has documented a link between childhood sexual abuse (CSA) and indicators of quality of life among Black MSM. The purpose of the present study was to investigate the prevalence of childhood sexual abuse and examine the cross-sectional associations between CSA and indicators of quality of life (namely history of homelessness, history of incarceration, and subjective social status) among Black MSM in the Deep South. Between 2013-2014, 465 BMSM who reported engaging in anal and/or oral sex with another man in the past 6 months were recruited from two Southern U.S. metropolitan areas (Jackson, MS and Atlanta, GA). Participants completed an electronic survey containing questions regarding various socio-cultural factors. CSA was assessed by asking participants 10 questions about sexual experiences before the age of 18. Correlations were computed between CSA, subjective social status, history of incarceration, and history of homelessness. Study analyses included complete data from 372 participants with a mean age of 30.4 years. The majority of participants self-identified as gay/homosexual (54.4%). The majority of participants reported at least one form of CSA. Results revealed that CSA was associated with history of homelessness and history of incarceration, but not subjective social status. Our findings suggest that CSA is associated with quality of life among Black MSM. In studies examining CSA among women, CSA has been shown to be associated with negative affect, poor decision making, impulsivity, and physical health problems. Research examining the associations of CSA among Black MSM is warranted. In addition, structural interventions are needed to address this major societal problem.

S.5 Defining the Becoming a Healthier U Program at Open Arms Healthcare Center

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The Jackson Metro area has some of the highest rates of sexually transmitted diseases in the state of Mississippi. The most prevalent diseases include syphilis, chlamydia, gonorrhea, and the Human Immunodeficiency Virus. At Open Arms Healthcare Center, programs have been implemented to reduce the prevalence of sexually transmitted diseases in the Metro area. Specifically, the Becoming a Healthier U program, which is a free program designed to provide patients with access to preventive health screenings as well as a variety of preventive mental and sexual health counseling. Some services included in the BHU are: health risk assessments and screening for STDS and high risk sexual behaviors just to name a few. The BHU program is vital because it brings awareness to one's overall health. When most people think of being healthy the first thing that comes to mind is diet and exercise. Even though diet and exercise are two very important components of being healthy; one's sexual health is something that needs to be taken just as seriously. With STD rates on such an alarming rise, the BHU program has been effective with informing patients of their sexual health status.

S.6 Does the South give African American MSM a higher risk for contracting HIV/AIDS and how can they decrease the high numbers of HIV/AIDS cases per year?

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According to the Duke Center for Health Policy and Inequalities Research, the South (Texas, Georgia, Mississippi and Louisiana) have been leading the nation with the most cases of HIV/AIDS for the past ten years (Reif). Eight of the ten states with the highest rates of new HIV infections were located in the South. By group, African American MSM have the highest percentage of HIV/AIDS cases. There are many methods available within the United States to prevent as well as treat HIV/AIDS. However, all of those methods are not being used to its full extent in the Southern region of the United States. The purpose of our research is to find out if the South gives African American MSM a higher risk of contracting HIV/AIDS. We found several articles as well as statistics to research our topic. Upon completion of our research we found that the South, in fact, does not give African American MSM the proper care when it comes to HIV/AIDS. The South has cut funding from various programs and neither do they offer sexual education classes to educate the African American MSM population on protecting themselves against the disease. Many steps must be taken in the future in order to decrease the number of African American MSM who are at risk for contracting HIV/AIDS.

S.7 Condomology: The Use of Condoms among HIV Positive and Non-HIV Positive Men who have Sex with Men Main and Casual Partners

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The main source of HIV transmission is among men who have sex with men (MSM) in through unprotected anal intercourse (UAI). Condoms are a method that reduces the risk of transmitting HIV to partners. The aim of this study is to analyze the association between the usage of condoms during anal sex among HIV positive and Non-HIV MSM with main and casual partners. Descriptive and association testing were used to conduct this study, and participants were recruited from the MARI study. The Minority Aids Research Initiative (MARI) was developed to examine the sexual behavior and the prevalence of HIV/STI (sexually transmitted infections) in African-American (AA) males who have sex with males (MSM) in the Southeastern United States. Overall, the project is an ecological study that aims to gain a better understanding of the complex interaction between individual-level factors and environmental contexts, as well as their association with high-risk sexual behaviors among AA MSM. The research study is being conducted by MBK at two sites located in the Southeastern region of the United States – Jackson, MS & Atlanta, GA. The results show that 52% of HIV positive men reported not always using condoms with a main partner over a one year period; 38% of HIV positive men reported not always using condoms with a casual partner over a one year period. These results suggest that there are factors that influence why MSM choose not to use condoms during intercourse such as they may not fit – too large or too small – they may be allergic, or simply do not like the way they feel.

S.8 Cancer: The Effects of HIV and Antiretroviral Therapy

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People with HIV have a significantly higher risk of getting certain types of cancer compared to uninfected individuals. Some of these types of cancers would be known as “AIDS-defining malignancies”: Kaposi Sarcoma and non-Hodgkin Lymphoma. People who are infected with HIV have an increased risk of these cancers due to their immune system being weakened and having an inability to fight off the toxicities that lead to cancer. Antiretroviral therapy is the mixture of antiretroviral medicines that help slow down the rate in which HIV duplicates itself in the body. The combination of three antiretroviral medicines is more efficient than using only one medicine to treat HIV. With antiretroviral therapy and one of these therapies called HARRT it has decreased sarcoma and non-Hodgkin’s lymphoma among infected individuals because it lowers the amount of HIV circulating in the bloodstream allowing the immune system to restore. The risk of specific side effects varies from drug to drug, from drug class to drug class, and from patient to patient. In this study I also look at the interactions of AID malignancies on different populations such as long term survivors not on antiretroviral therapy and individuals who are on types of antiretroviral therapies and how these effects portray different outcomes. Overall antiretroviral drugs lower the risk of Kaposi sarcoma and non-Hodgkin lymphoma and increases overall survival.

S.9 HIV and Mental Health

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Research has shown that the human immunodeficiency virus (HIV) has become an endemic in the southernmost region of the United States. An endemic by definition is a disease or condition regularly found among particular people or in a certain area. HIV is most commonly found (in the US) among MSM, or men who sleep with men, in major southern metropolitan areas such as Jackson, MS, Miami, FL, and Atlanta, GA. Research across the country has also be able to confirm that a majority of people who are living with HIV/AIDS (PLWA) are also living with at least one other sexually transmitted disease. Many struggle with other chronic conditions such as diabetes, hepatitis, obesity, and alcohol and drug abuse. However, one of the most common and most overlooked issues is the health of the mind in the case of HIV positive individuals. The purpose of my investigation is to study exactly how HIV affects the human brain. The two main focuses are an HIV diagnosis for a person who was previously battling a mental health disorder and how the actually diagnosis may lead to a more thoughtless, reckless lifestyle, risky behaviors, and alcohol and/or drug abuse.

S.10 Associations between Masculine Perception and Sexuality with Risky Sexual Behaviors among African-American Men who have Sex with Men.

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African-American men who have sex with men (BMSM) have been the main group of people most affected by HIV since the 1990s. BMSM often deal with the struggles and adversity, identifying both as black and gay. As a result, the way people perceive this community tend to shape and influence certain sexual behaviors, which put these individuals at risk for HIV transmission. For this project, we focus on identifying if perception and masculinity have an effect on sexual behaviors. This cross-sectional analysis included data from HIV infected and uninfected BMSM enrolled in The MARI Study. Participants completed surveys via audio computer-assisted self-interview technology and underwent rapid HIV testing, if applicable, to confirm HIV serostatus. We analyzed the data using descriptive statistics and t-tests to determine any associations. We saw significant correlations between openness with parents and siblings about sexual orientation and condom usage with main partners, as well as alcohol usage before or during sex. This coincides with the CDC making the statement that negative attitudes towards BMSM, and those who can't cope with it, are three times more likely to engage in risky sex. We see that people's perception of both masculinity and homosexuality does have an influence on sexual behavior. Public health departments, should work on developing spaces: that counsel BMSM on developing techniques on disclosing their sexuality (especially to families and loved ones), as well as continue to educate BMSM about the risks of condomless anal sex.

S.11 The Importance of the Language Access Plan*Bijalben Patel¹ and Dr. Tanya Funchess^{2*}*¹ *Mississippi INBRE Service Scholar, Millsaps College, Jackson, MS*² *Mississippi State Department of Health, Jackson, MS*

The purpose of my project is to develop and finalize a Language Access Plan for the Mississippi State Department of Health (MSDH). English is the predominant language in U.S., but there are millions of residents who are not fluent in English and often struggle when interacting with others. Title VI of the Civil Rights Act of 1964 prohibited discrimination among recipients of federal funds based on race, gender, etc., and Executive Order 13166 expanded on this to include persons with limited English proficiency (LEP) by providing interpreters and translated educational and informational materials. Individuals categorized as LEP may show limited ability in reading, speaking, writing, and understanding English. These individuals will be accommodated for by the Language Access Plan, since it will be designed to provide interpreting service access to LEP patients. Therefore, the goal of the Language Access Plan is to ensure that the MSDH is effectively communicating with LEP individuals by providing proper resources, and this will help reduce the language barrier between the patient and the provider. Before placing the plan into action an assessment will be developed to help the MSDH determine the current status of access to LEP patient services. As a result of the plan and the assessment, patients with LEP will be informed about the interpreting services provided by the MSDH, and the employees of the MSDH will be trained on how to assist patients with LEP.

S.12 The Prevalence of Obesity in the Delta*Michael Pham¹ and Daniel Chavez-Yenter^{2*}*¹ *Mississippi INBRE Service Scholar, Hinds Community College, Raymond, MS*² *My Brother's Keeper, Inc., Jackson, MS*

Obesity has been a persistent issue that has been steadily impacting America over the last couple of decades. Specifically, Mississippi currently has a higher prevalence of obesity than the rest of the country, with an adult obesity rate of 35.5%, making it the third most obese state in the nation. The age group that has the highest percent of obesity, 41.5%, are people that range from 26-44 years old and African Americans suffer from the largest obesity prevalence, 43.0%. In addition, Mississippi has the highest childhood obesity rate in the nation, with the children ranging from ages 10-17. Obesity can also lead to other chronic illnesses such as diabetes, hypertension, heart disease, arthritis, and sometimes even cancer. To aim at a more specific area in Mississippi, the Delta has the highest rate of obesity throughout the entire state. This study aims to describe the prevalence of obesity throughout the state of Mississippi and its respective regions as well as identify the factors that may contribute to obesity and its co-related morbidities, such as the food environment index, the amount of physical activity, access to exercise opportunities, and the number of primary care physicians.

S.13 Inequality and Health Disparities: Inevitable Correlation Due to Causes*Ashleigh Pope¹, Xandria Short², Jordan Bush², Henry D. Fuller^{3*}*¹ *Mississippi INBRE Service Scholar, Holmes Community College, Goodman, MS*² *Mississippi INBRE Service Scholar, Alcorn State University, Lorman, MS*³ *My Brother's Keeper, Inc., Jackson, MS*

Health disparities are the inequalities that occur in the provision of health care and access to healthcare across different racial, ethnic and socio-economic groups. Access to quality healthcare does not always equate good health outcomes. However, socioeconomic status, geographic location and cultural barriers, both presently and in the past, all contribute to an individual's ability to achieve good health. Data was pulled from the 2013 Community Health Needs Assessment sponsored by My Brother's Keeper, Inc. to examine the correlation between inequalities and health disparities in three regions within the state. Descriptive statistics were run from the variables related to health inequalities and secondary data analysis was also used to better understand health inequalities in Mississippi. The data pulled from the 2013 Community Health Needs Assessment shows that the Coastal region of Mississippi is the least healthiest region followed by the Central region and lastly the Mississippi Delta. This study helps to prove that socioeconomic status, cultural barriers and geographic location all contribute to an individual's health. It was also reported that in 2008, approximately 33%, of people surveyed identified themselves as belonging to a racial or ethnic minority population. Also in 2008, approximately 12% or 36 million people not living in nursing homes or residential care facilities had disability. The goal is to ultimately reduce various health disparities throughout the country and improve the health of all socioeconomic groups. To do this, one has to focus primarily on the various health disparities at risk to various minorities and socioeconomic groups and health care services available to them. However, the absence of diseases and access to healthcare does not automatically equate to good health

S.14 The Relationship Between Lifestyle Behaviors and STD Rates Among Young Adults in Mississippi Between Ages 15-24.*Monisa Stallion¹, Lauren Coon², Krystal L. Phillips^{3*}*¹ *Mississippi INBRE Service Scholar, Alcorn State University, Lorman, MS*² *Mississippi INBRE Service Scholar, Holmes Community College, Ridgeland, MS*³ *My Brother's Keeper, Inc., Jackson, MS*

The Center for Disease Control and Prevention (CDC) estimates that there are approximately 20 million new STD infections each year- almost half of them among young people ages 15- 24. Because many cases of STDs go undiagnosed the reported cases of chlamydia, gonorrhea, and syphilis represent only a fraction of the true burden of STDs in the United States. Compared with older adults, sexually active adolescents aged 15-19 years old and young adults aged 20-24 are at a higher risk for acquiring STDs for a combination of behavioral, biological, and cultural reasons. Specifically in Mississippi, in 2013, it was reported about 12,930 chlamydia cases and 3,337 cases of gonorrhea. Data from Healthy People 2020 suggest that several factors contribute to the spread of STDs. We hypothesize that social, economic, and behavior factors that affect the spread of STDs include racial/ ethnic disparities, poverty, access to health care, and substance abuse. The aim of this study is to determine the lifestyle behaviors among young adults as it relates to the STD rates in the state of Mississippi. At the conclusion of this study, it was determined that the leading cause of sexual transmitted diseases maybe less of nonchalant attitudes and more of life style behaviors. Unprotected sex, engaging with multiple partners, use of drugs and alcohol, and trading sex for money can all increase the STD rates among the young adults in Mississippi. A limitation of the study is that the surveyed sample may not be representative of the entire population of young adults in MS. On the other hand, this study suggests that increased awareness of risky lifestyle behaviors can decrease STD rates among these young adults, along with social and individual encouragement. Promoting healthy sexual behaviors, strengthening community capacity, and increasing access to quality services can all prevent STDs and their complications.

S.15 Investigating the Association Between Sexual Education And Sexual Behavior Among College Students In Central Mississippi.

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More than 9,500 Mississippians are living with HIV, while young people age 13-19 make up 18% of this population. Mississippi is also number two in the nation for chlamydia and gonorrhea. Sexual education is needed in order to inform teens of the risks of contracting HIV and STDs. The aim of this study was to determine if there was a significant correlation between college students who attended a sexual education course in high school and their current sexual behavior, knowledge and awareness. Secondary data was collected from the CDC's website and primary data was collected from quantitative surveys disseminated to college students in central Mississippi. Results show a narrow association between lack of sexual education and risky sexual behavior. Findings showed that 58% of students did not have any sexual education. Approximately 60% of students stated they engaged in sexual intercourse before the end of their senior year. Among those 44% admitted to not using a condom the last time they had sexual intercourse. Sexual education is important for teens to understand their reproductive health. By participating in a sexual education class, students will have the confidence to make responsible decisions when engaging in sexual intercourse. With an increase in sexual education, we could start to see a decrease in HIV and STD rates among college students. It is also important for students not only to be taught about abstinence but also incorporate birth control and reproductive health into their curriculum.

S.16 Sociocultural Factors Associated With HIV Testing Fear and Anxiety Among African American Men Who Have Sex With Men in the Jackson, MS MSA

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According to the Centers for Disease Control and Prevention (CDC), nearly 1.2 million Americans are living with HIV. However, one in eight of them don't know it. Young people are significantly affected with youth ages 13 to 24 accounting for one in five HIV diagnoses in 2014 of which 80% of those were gay and bisexual males. In Jackson, MS, 4 out of 10 gay and bisexual males are reported as living with HIV – the highest incident rate of its kind in the nation. Although CDC recommends that everyone between the ages of 13 and 64 get tested at least once in their lives, data suggests that due to HIV testing accessibility hindered by lack of adequate transportation, low-to-no access to evidence-based reproductive health or HIV/AIDS knowledge in schools, and clinical hours that do not support student schedules, many youth do not receive HIV or STI tests. Data from CDC also suggests that adults do not test for fear of being stigmatized and due to a belief that HIV exposure is not probable because of their lack of knowledge regarding HIV/AIDS risks factors. The aim of this study is to determine the sociocultural factors associated with HIV testing fear and anxiety among African American men who have sex with men (AAMSM) in the Jackson, MS metropolitan statistical area which includes Hinds, Rankin, Madison, Copiah and Simpson Counties. At the conclusion of this study, it was determined that core barriers to testing may be less about fear and anxiety and more about the lack of perceived necessity to test and testing service access. Although fear and anxiety play parts in a person decision to receive an HIV test, inadequate transportation and insufficient knowledge regarding HIV/AIDS may be a more prominent basis for testing barriers in the Jackson, MS MSA. This study suggests that increased HIV and STI testing services and education in community and schools settings, enhanced transportation systems and support, along with social and individual encouragement may increase the probability of HIV testing; thus, increase individual and social awareness regarding HIV statuses.

Mississippi INBRE

Institutional Undergraduate Research

U.1 Properties of Natural Flavonoid Morin in DNA and Protein Environments

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Flavonols are the type of flavonoids which are a set of secondary metabolites in plants. They are widely studied for their potential to treat or even prevent diseases, display antibacterial and antifungal properties, and act as inhibitors of inflammation mechanisms. The present study is focused on a common flavonol morin, which is widely present in citrus fruits. A number of *in vitro* studies have shown that morin may have disease fighting properties. However, the behavior of morin in macromolecular environments is not known. Hence, in the present study, an exploratory study on morin has been performed in protein and DNA microenvironments. Human serum albumin (HSA) and DNA oligonucleotides have been chosen as models for macromolecules. HSA is the natural carrier of drugs/small molecules in physiological system. Three types of DNA (C₄ i-motif, complementary G₄ tetraplex, duplex made from the C and G rich sequences) have been chosen based on the sequence of telomeric region of human chromosomes. Absorption, fluorescence, and circular dichroism (CD) spectroscopic measurements have been carried out. Studies indicated morin binds in the hydrophobic cavity of HAS. Examining morin in HSA at multiple temperatures allowed us to compute the free energy values for this spontaneous binding. Morin binds at the loop and between base pairs in tetraplex and duplex DNAs. From the analysis of our data, we can conclude that morin spontaneously binds with DNA and protein. We like to extend this study using other derivatives of morin.

U.2 Effects of Reusing Gel Electrophoresis and Electrotransfer Buffers on Immunoblotting

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BACKGROUND AND OBJECTIVES: SDS-PAGE and western blotting are two of the commonly used biochemical methods for protein analysis. Proteins are electrophoretically separated based on their molecular mass by SDS-PAGE, and then electrotransferred to a membrane surface for protein-specific analysis by western blotting. Electrophoresis buffer (EB) and Towbin's transfer buffer (TTB) used for these procedures are salt-based with later consisting of 10-20% methanol. Methanol serves in removing SDS from the proteins and facilitate their binding to membrane, however, known for its toxicity. Previous reports present a contradictory view in favor [Pattegrewe *et al.*, 2009] and against [Y. Dorri *et al.*, 2010] reusing of TTB in order to reduce the toxic waste. In this report, we therefore present a detailed analysis of not only reusing TTB but also EB. **METHODS:** SDS-PAGE and western blotting were performed as per the standard procedures. EB and TTB were saved at the end of each run and were reused for subsequent SDS-PAGE and/or western blotting. **RESULTS:** Multiples usage (upto 5-times) of EB didn't have any affect on protein profiles of a broad range protein molecular weight marker, BSA, and crude cell lysates. Additionally, reusing of EB didn't affect the quality of subsequent western blotting of proteins ranging from low to high molecular weights (10-250 kDa). Reuse of TTB on the other hand diminished the signal of a high molecular weight plasma membrane protein called CFTR in western blotting. **CONCLUSIONS:** EB can be used atleast for 5-times without compromising the quality of protein profiles and western blotting. TTB on the other hand cannot be reused in western blotting.

U.3 Analysis of the DNA-Cleaving Efficiencies and Mechanism of Bifunctional DNA-Cleaving Reagents

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Current Photodynamic therapy uses sensitizers to generate singlet oxygen which causes cell death. The hypoxic environment of most cancer tissues makes oxygen a limiting reagent for this approach and several methods have recently been developed to circumvent this problem. The photoinduced homolytic N-O bond cleavage of N-Heteroaromatic compounds with an N-alkoxy substituent (onium salts) leads to the formation of a heteroaromatic radical cation and an alkoxy radical. Both of these species have been shown to induce DNA cleavage, each with a different mechanism. The synthesis of the nitrogen onium salts includes the oxidation of the heteroaromatic nitrogen and subsequent O-alkylation. To increase the DNA cleaving efficiency by enhancing ground-state association we synthetically attached a known DNA-binder, 1,8-naphthalimide. Several bifunctional compounds have been synthesized and their photochemistry has been investigated. Here we present the DNA cleaving efficiency of a series of bifunctional DNA-cleavers which has been analyzed by gel electrophoresis and CD spectroscopy. A thermal effect is explained by molecular docking studies. The influence of quenchers has been analyzed and indications of the reaction mechanism are discussed. It appears as though oxygen is inhibiting the photocleavage. The bifunctional compounds can be used to efficiently initiate DNA-cleavage. Oxygen appears to inhibit the reaction and thus the compounds could exhibit an increased activity in hypoxic tissues.

U.4 Disruption of Amyloid-Beta Peptide Aggregation

*Darrian Kelly and Bidisha Sengupta**

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Amyloid-beta peptide aggregations develop amyloid plaques in Alzheimer's disease. These aggregations are the result of multiple misfolded amyloid-beta peptides. Flavonoids are a group of metabolites with antioxidant properties that have the potential to disrupt the aggregation of the peptide, preventing the development of amyloid plaques in Alzheimer's disease. To examine flavonoid efficacy for disrupting aggregation, AutoDock Vina was used to develop molecular models of the individual flavonoid ligands binding to the amyloid-beta peptide. Affinity values were obtained from the ligand-protein docking after creating molecular models for the following eight flavonoids: Apigenin, Curcumin, Daidzein, Fisetin, Genistein, Morin, Myricetin, and Quercetin. While all of the ligands were shown to spontaneously bind to the protein, Morin has the greatest affinity for the peptide. Obtaining these affinity values allow for further examination of the aggregation of amyloid-beta peptide by treating the protein with individual flavonoids and examining the extent of aggregation after incubation. As a neurodegenerative disorder, Alzheimer's disease is often diagnosed in individuals with insufficient sleep. Low levels of neurotransmitters, such as melatonin (MT) and serotonin (5HT), are found to be associated with sleep disorder. For this reason, we hypothesize that optimum concentrations of MT and 5HT will disrupt the aggregation of amyloid-beta peptide and prevent the development of amyloid plaques. The present study will be carried out in-vitro and will lay a foundation for additional research on evaluating amyloid-beta peptide aggregation using mass spectrometry and fluorescence.

U.5 Generation of reticulon knockout *Tetrahymena thermophila*.

*Michael Patterson, Brianna McField, and Sabrice Guerrier**

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Autophagy is a process by which cells degrade cellular material for recycling in the absence of nutrients. Recent evidence has suggested that this process is not limited to cases of nutrient deprivation, but that selective degradation of specific organelles in the presence of nutrients may also occur. Current models suggest that selectivity may arise from the interaction of specific proteins on the surface of organelles and/or the membranes used to expand the autophagosome. Importantly, it remains unclear whether these models apply to autophagy of the nucleus (nucleophagy) despite the recently discovered role of nucleophagy in laminopathies, cancer, and development. Here we use the ciliate, *Tetrahymena thermophila* as a model system to study nucleophagy since *Tetrahymena* degrade their nuclei by an autophagy like mechanism as part of their normal mating program. Using the expression profiles within the *Tetrahymena* Gene Expression Database (TGED) we have identified Reticulon, as a gene that could play a role in autophagy of the macronucleus since reticulon family proteins have been shown to tubulate endoplasmic reticulum membranes (the most widely observed source of autophagosomal membranes) and related were recently shown to act as autophagosome receptors in yeast. Lastly, we find that reticulon is coexpressed with Rab21 and Rab11, proteins that have been shown to regulate trafficking during autophagy in other systems and SNX4, which our lab has shown localizes to the degrading macronucleus. Based on these observations, we aimed to determine the effects of reticulon deletion on nucleophagy in *Tetrahymena*. To do this we amplified the 5' and 3' untranslated regions (utr) of reticulon using polymerase chain reaction. We then introduced these fragments into regions of a plasmid flanking an inducible promoter that drives the expression of a drug resistance marker. The resulting plasmid was then introduced into *Tetrahymena* using biolistic transformation in the presence of drug for the purposes of selection. Future experiments will focus on the effects of reticulon deletion on the degradation of the parental macronucleus.

U.6 Determination of Transmission Methods of *Trichomonas vaginalis* virus Through EFP Fusion Fluorescence Microscopy

*Karam Rahat and Cory Toyota**

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Trichomoniasis is the most common nonviral sexually transmitted disease (STD) in the world. The causative agent is the protozoan *Trichomonas vaginalis*. *T. vaginalis* itself can be infected with *Trichomonas vaginalis* virus (TVV), a dsRNA virus, through an unknown mechanism. *T. vaginalis* is believed to reproduce via binary fission; however, it is possible that TVV induces a form of genetic exchange between *T. vaginalis* protozoa. Different strains of TVV may influence the protozoan to varying degrees, which may also be dependent on the respective protozoan genotype. Further observation of TVV transmission mechanisms and documentation of these mechanisms in relation to viral strain and *T. vaginalis* genotype can provide insight into combating trichomoniasis. Enhanced green fluorescent protein (EGFP) and enhanced red fluorescent protein (ERFP) genes can be inserted with portions of the TVV genome at different loci and cloned into a plasmid vector (pNH-TrxT) at the Nco1 restriction site and transfected into *Trichomonas vaginalis*. Different strains will be tagged with red and green and observed through fluorescence microscopy. The presence of fluorescence within successive generations, the color, and specific location of each color will provide insight into the method of genetic exchange and the nature of inheritance of *Trichomonas vaginalis*. Comparison between different strains and control groups may assist in determining the influence TVV carries in these processes.

U.7 Pyromellitdiimide Photochemistry*Donya Razinoubakht*¹, *Gurjit Kaur*¹, *Sabrina Molitor*², *Axel G. Griesbeck*², *Wolfgang H. Kramer*^{1*}¹ Millsaps College, Department of Chemistry and Biochemistry, Jackson, MS² Universität zu Köln, Department of Chemistry, Cologne, Germany

Background: Pyromellitdiimides are used as electron acceptors in photochemical applications due to their reduction potential and prominent radical anion absorption. Their high stability has led to the use of pyromellitic diimides in polymeric films such as Kapton. The similarity to phthalimide might make it a suitable chromophore for the decarboxylative photocyclization, a preparative photochemical method for the synthesis of small to medium rings. The strong one electron acceptor properties can be used to oxidation and thus selective cleavage of biomolecules. **Methods:** The pyromellitic diimides were synthesized substituted with N-alkyl carboxylic acids. Irradiations in aqueous solution at pH 7, followed by extraction and column chromatography yielded the cyclization products. UV/Vis spectroscopy and EPR/NMR were used to detect the long lived radical anion. **Results:** Pyromellitic diimide undergoes decarboxylative photocyclization to yield a large number of regio- and stereoisomers. Interestingly, the radical anion formed after the first PET is extremely stable and has a lifetime of several days in deoxygenated solution. The radical anion was confirmed by EPR and NMR. An interesting spacer dependency was observed. **Conclusions:** The long-lived radical anion of pyromellitic diimide makes it an ideal electron trap after oxidation of a donor. The dianion is a species with strong reducing power and can thus be used to selectively reduce acceptors.

U.8 Understanding the Role of *msaABCR* Operon in Biofilm Development of *Staphylococcus epidermidis*, RP62A*Victoria Reid*¹, *Kathrine Lindgren*¹, *Erin Riggins*^{2*}¹ Mississippi INBRE Student Researcher, Mississippi Gulf Coast Community College Jefferson Davis Campus, Gulfport, MS² Science Instructor/PI, Mississippi Gulf Coast Community College Jefferson Davis Campus, Gulfport, MS

A newly described operon, *msaABCR*, has recently been linked to biofilm development, virulence and antibiotic resistance in *Staphylococcus aureus*. Bioinformatics analysis showed good homology between *msaABCR* in *S. aureus* and *S. epidermidis*. Therefore, we hypothesized that *msaABCR* will play a similar role in the regulation of biofilm development in *S. epidermidis* strains. To better understand wild-type biofilm production, environmental assays were conducted. *S. epidermidis* was grown in TSB supplemented with different concentrations of NaCl, glucose or EtOH. Also, compounds similar to those found in host immune responses such as NaMp, proteinase K, DNase I, and Dispersin B were applied at different time points to determine effects of each on biofilm development. The *msaABCR* deletion construct has been made, verified, and moved to *S. aureus* RN4220 strains. The construct will be introduced to RP62A to delete *msaABCR* and study its effect on biofilm development using these same assays. Environmental assays indicated that ideal conditions for *S. epidermidis* biofilm growth are 3% NaCl, 2% glucose, and between a 1-5% EtOH concentration. Dispersin B and NaMp decreased biofilm production when introduced in the early stages, suggesting that *S. epidermidis* may have a PNAG-dependent biofilm. This study may help define the role of *msaABCR* in *S. epidermidis* biofilm development and virulence. It may also be therapeutically relevant in control of biofilm-associated infections in *S. epidermidis* and *S. aureus*.

U.9 Microwave Assisted Synthesis of Chiral Alkylated-Aniline and its Characterization in Human Serum Albumin using Spectroscopy and Molecular Modeling

Chirantan Sen Mukherjee^{1,2}, *Darrian Kelly*¹, *Bidisha Sengupta*^{1*}, *George Armstrong*^{1*}

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Microwave irradiation offers a convenient way to synthesize optically active alkylated aniline following the protocol given below. It is rapid and inexpensive with almost 70% yield. Aniline, arylamines and heterocyclic aromatic amines are known carcinogens. Recently aniline mustard has come into prominence as novel anticancer agent. In this study, we like to explore the binding behavior of DMPA in naturally occurring drug carrier protein human serum albumin (HSA), in order to understand its therapeutic importance. We have used spectroscopic and molecular modeling tools to find out the binding constant, sites and energy for the association. Several binding sites have been noted by docking studies and some amino acids namely lysine, alanine, leucine, and glutamic acid have been found to play crucial role in the binding process. Further studies are underway.

U.10 Conditions for Electrospinning Natural Polymer Fibers

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Recent evolutions in the field of biomaterials have focused on developing materials that can facily interface with biological systems to treat or replace tissues or functions of the body. Natural polymers including polysaccharides have been investigated as suitable biomaterials to mimic the environment of body tissues and facilitate tissue regeneration as well as aid in controlled drug delivery. Electrospinning natural polymers like alginate and chitosan yields nanofibers that have shown promise as tissue scaffolds and drug delivery vehicles. However, these renewable biopolymers contain inherent charges, which make it difficult to electrospin these polymers, thus researchers continue to investigate the optimal electrospinning conditions for biopolymer fiber formation. In this project, the formation of nanostructures was explored using natural polymer solutions with glycerol or ethylenediamine as solvents as well as a variety of additives that could assist nanofiber formation, including co-polymers and neutralizing solutions. Other electrospinning parameters were also explored including distance to the target and flow rate. It was found that the positively charged natural polymer chitosan formed fibers most easily when it was electrospun with another polymer while the negatively charged natural polymer alginate formed fibers when it was electrospun with a co-solvent system. It was concluded that several natural polymers electrospin best when an additive, either a co-solvent or a co-polymer, is added to the biopolymer solution. It is thought that these nanostructures could be applied towards the controlled delivery of small drug molecules.

U.11 Elucidating ligand selective responses of Androgen Receptor*Raquema Williams, Sandipan Chakraborty, Pradip K Biswas***Department of Physics, Tougaloo College, Tougaloo, MS*

Like in breast cancer, de-novo and acquired resistances of hormone therapy are of major concerns in combating prostate cancer. Dietary supplements containing flavonoids, in particular, resveratrol and its analogues are being suggested to inhibit the progression of prostate cancers. Using in-silico techniques, we study the hydrogen bonding contacts of six different ligands to understand their ability to act as an agonist or antagonist. In particular, employing the crystal structures of Androgen Receptor (AR), molecular modeling, and molecular dynamics simulation, we analyze the hydrogen bonding pattern of the ligands. From the hydrogen bonding pattern of DHT (a known AR agonist) and Flutamide (a known AR antagonist), we first identify the non-overlapping contacts and then analyze the properties of resveratrol analogues based on their contacts. In addition to the hydrogen-bonding contacts, ligand binding energies to the protein also provides us a clue of which ligand could act as a potent antagonist. Accordingly, we conclude that the ligand binding energy and ligand hydrogen bonding contacts to the protein, can supplement existing the drug designing effort in a major way.

U.12 1,8-Naphthalimide Fluorescence in Reverse Micelles*Shizhe Zhang, Melinda K. Solomon, Anna K. Allred, Irene S. Corrao, James P. McVaugh, Emily H. Stewart, B. Woods Curry, Wolfgang H. Kramer***Department of Chemistry and Biochemistry, Millsaps College, Jackson, MS*

The moderate fluorescence of 1,8-Naphthalimides can be used to localize conjugated compounds in various environments. Our DNA-cleaving nitrogen onium salts are connected to 1,8-naphthalimides which should allow us to track their movement in tissues due to the variable fluorescence. 1,8-naphthalimide fluorescence is strongly influenced by solvent polarity, an ideal requirement for a fluorescence sensor system. To obtain more information about the quenching process, intermolecular quenching experiments are employed. Quenching of N-methyl 1,8-naphthalimide with various pyridine derivatives with electron donating and withdrawing substituents shows that certain substitution positions are more efficiently quenching than others. The electron-rich N-oxides are efficient fluorescence quenchers. The substitution position plays an important role and several interesting aggregation effects were observed. To mimic the membrane environment we analyzed the fluorescence of 1,8-naphthalimides in reverse micelles. AOT as an anionic surfactant in reverse micelles electrostatically attracted the cationic nitrogen onium moiety, but the fluorophore appears to localize in the hydrophobic part of the system. Further experiments in various reverse micelles need to be undertaken to verify these findings.

Poster	Author	Institution	Page
S.16	Abdul-Haqq, Deja	My Brother's Keeper, Inc.	26
R.15	Adewunmi, Yetunde	The University of Southern Mississippi	10
U.1	Ali, Marina	Georgia Institute of Technology	27
U.12	Allred, Anna K.	Millsaps College	32
R.15	Amato, Dahlia	The University of Southern Mississippi	10
R.15	Amato, Douglas	The University of Southern Mississippi	10
U.9	Armstrong, George	Tougaloo College	31
U.2	Avery, Jamie	Mississippi University for Women	27
R.10	Babski-Reeves, Kari L	Mississippi State University	7
R.29	Bai, Fengwei	The University of Southern Mississippi	17
R.1	Balamurugan, Karthik	The University of Southern Mississippi	3
R.2	Barner, Brandon	Jackson State University	3
R.3	Barnes, Allison	Tougaloo College	4
S.6	Barnes, Christopher	My Brother's Keeper, Inc.	21
R.25	Bean, Cynthia	University of Mississippi Medical Center	15
R.12	Benghuzzi, Hamed	University of Mississippi Medical Center	8
R.14	Benghuzzi, Hamed	University of Mississippi Medical Center	9
R.26	Benghuzzi, Hamed	University of Mississippi Medical Center	15
R.28	Benghuzzi, Hamed	University of Mississippi Medical Center	16
R.31	Benghuzzi, Hamed	University of Mississippi Medical Center	18
R.16	Bhatt, Abhay J.	University of Mississippi Medical Center	10
U.11	Biswas, Pradip K.	Tougaloo College	32
R.17	Blackwell, Amanda	University of Mississippi Medical Center	11
R.4	Bonner, Hannah	Belhaven College	4
S.1	Boone, Joshua C.	Hinds Community College	19
R.3	Bowles, Taylor	University of Mississippi Medical Center	4
R.25	Bowles, Taylor	University of Mississippi Medical Center	15
R.1	Budachetri, Khemraj	The University of Southern Mississippi	3
R.7	Budachetri, Khemraj	The University of Southern Mississippi	6
R.7	Bullard, Rebekah	The University of Southern Mississippi	6
U.10	Buschle-Diller, Gisela	Auburn University	31
S.2	Bush III, James	Alcorn State University	19
S.13	Bush, Jordan	Alcorn State University	25
R.10	Calhoun, Alex	Mississippi State University	7
R.5	Cannaliato, Sharon	Pearl River Community College	5
U.11	Chakraborty, Sandipan	Tougaloo College	32
S.12	Chavez-Yenter, Daniel	My Brother's Keeper, Inc.	24
R.6	Chukwuemeka, Edna	Millsaps College	5
R.7	Clark, Annabelle	The University of Southern Mississippi	6
S.9	Clark, Johnlyn	University of Mississippi Medical Center	23
R.20	Coolen, Lique M.	University of Mississippi Medical Center	12
S.14	Coon, Lauren	Holmes Community College	25
U.12	Corrao, Irene S.	Millsaps College	32
R.7	Crispell, Gary	The University of Southern Mississippi	6
U.3	Curry, B. Woods	Millsaps College	28
U.12	Curry, B. Woods	Millsaps College	32
S.5	Curtis, Tamika	My Brother's Keeper, Inc.	21
R.14	Dasan, Shareena	Jackson State University	9
S.4	Dawkins, Milton	My Brother's Keeper, Inc.	20
R.10	Debusk, John	Mississippi State University	7
R.32	Dhital, S.	Mississippi State University	18
R.6	Diggs, KiOsha	University of Mississippi Medical Center	5
R.8	Downs, Latoyia	The University of Southern Mississippi	6

Poster	Author	Institution	Page
R.8	Elasri, Mohamed O.	The University of Southern Mississippi	6
R.30	Elder, Steve	Mississippi State University	17
R.9	Everett, Michelle	Mississippi Gulf Coast Community College	7
R.16	Fan, Lir-Wan	University of Mississippi Medical Center	10
R.23	Fitzkee, Nicholas	Mississippi State University	14
S.13	Fuller, Henry D.	My Brother's Keeper, Inc.	25
S.11	Funchess, Tanya	Mississippi State Department of Health	24
R.5	Gavron, Nancy	Mississippi State University	5
R.32	Gilfeather, C.L.	Mississippi State University	18
S.3	Gipson, June	My Brother's Keeper, Inc.	20
R.19	Gordon, Donna M.	Mississippi State University	12
R.27	Gordon, Donna M.	Mississippi State University	16
U.7	Griesbeck, Axel G.	Universität zu Köln	30
R.24	Grimes, Jay	The University of Southern Mississippi	14
U.5	Guerrier, Sabrice	Millsaps College	29
U.10	Hamilton, Sharon K.	Delta State University	31
R.10	Hardy, Cassidy	Itawamba Community College	7
S.3	Harris, Takajah	Mississippi Valley State University	20
U.3	Hawkins, Deandrea J.	Millsaps College	28
U.2	Heda, Ghanshyam D.	Mississippi University for Women	27
U.2	Heda, Rajiv P.	Mississippi University for Women	27
S.4	Henderson, Joseph	Alcorn State University	20
S.1	Hickson, DeMarc	My Brother's Keeper, Inc.	19
R.6	Hinton, Shantele	University of Mississippi Medical Center	5
R.11	Holmes, Melody	Jackson State University	8
U.3	Hoth, Lauren M.	Millsaps College	28
S.5	Humphrey, Trianna	Tougaloo College	21
R.12	Iyanobor, Esther	Georgetown University	8
R.26	Iyanobor, Esther	Georgetown University	15
R.28	Iyanobor, Esther	Georgetown University	16
R.31	Iyanobor, Esther	Georgetown University	18
R.13	James, Logan	Mississippi State University	9
R.14	James, Markiesha	Jackson State University	9
R.19	Jiang, Jian	Mississippi State University	12
S.15	Johnson, Angela	My Brother's Keeper, Inc.	26
S.6	Johnson, Faith	Mississippi Valley State University	21
R.21	Johnson, H.	Mississippi State University	13
R.15	Jones, Dana	Pearl River Community College	10
R.16	Jones, Tembra K.	Tougaloo College	10
S.3	Jones, Teneshia	Mississippi Delta Community College	20
R.32	Kaplan, B.L.F.	Mississippi State University	18
R.1	Karim, Shahid	The University of Southern Mississippi	3
R.7	Karim, Shahid	The University of Southern Mississippi	6
U.3	Kaur, Gurjit	Millsaps College	28
U.7	Kaur, Gurjit	Millsaps College	30
U.1	Kelly, Darrian	Tougaloo College	27
U.4	Kelly, Darrian	Tougaloo College	28
U.9	Kelly, Darrian	Tougaloo College	31
R.17	Knowles, Alana	East Central Community College	11
U.3	Kramer, Wolfgang H.	Millsaps College	28
U.7	Kramer, Wolfgang H.	Millsaps College	30
U.12	Kramer, Wolfgang H.	Millsaps College	32
R.32	Kumhari, E.	Mississippi State University	18

Poster	Author	Institution	Page
S.7	Langston, Brenkeevia	Delta State University	22
R.16	Lard, Donisha D.	Murrah High School	10
S.8	Lawrence, Mary Kathryn	Millsaps College	22
R.16	Lee, Jonathan	University of Mississippi Medical Center	10
R.5	Lee, Jung Keun	Mississippi State University	5
R.18	Lewis, Breaunna	Tougaloo College	11
S.5	Lewis, Elanna	Jones County Junior College	21
U.8	Lindgren, Kathrine	Mississippi Gulf Coast Community College	30
S.5	Lindsey, Ilexis	Jackson State University	21
S.8	Lindsey, Joseph	My Brother's Keeper, Inc.	22
R.16	Lu, Silu	University of Mississippi Medical Center	10
R.16	Mao, Jinghe	Tougaloo College	10
S.9	Marshall, Makaila	Alcorn State University	23
R.15	Mavrodi, Dmitri	The University of Southern Mississippi	10
R.15	Mavrodi, Olga	The University of Southern Mississippi	10
U.5	McField, Brianna	Millsaps College	29
S.2	McNair, Obie	My Brother's Keeper, Inc.	19
S.10	McNair, Obie	My Brother's Keeper, Inc.	23
S.6	McNeal, Deborah	My Brother's Keeper, Inc.	21
U.12	McVaugh, James P.	Millsaps College	32
R.4	Miguel-Hidalgo, J. Javier	University of Mississippi Medical Center	4
U.7	Molitor, Sabrina	Universität zu Köln	30
S.9	Monger, Mauda	University of Mississippi Medical Center	23
R.3	Morris, Rachael	University of Mississippi Medical Center	4
R.17	Morris, Sorsha	University of Mississippi Medical Center	11
U.9	Mukherjee, Chirantan Sen	Madison Central HS, Tougaloo College	31
U.3	Mullins, Courtney B.	Millsaps College	28
R.32	Nichols, J.	Mississippi State University	18
S.3	Norton, Beneshia	Rust College	20
R.19	Nunes, Lydia	Mississippi State University	12
R.20	Nywening, Ashley V.	Belhaven College	12
R.22	Offiah, Ursula	Mississippi State University	13
U.2	Omotola, Oluwabukola	Mississippi University for Women	27
R.21	Pace, Timothy S.	East Mississippi Community College	13
R.16	Pang, Yi	University of Mississippi Medical Center	10
R.5	Park, Si Hong	University of Arkansas	5
R.22	Parker, Phenique	Mississippi State University	13
S.10	Parkman, Benjamin	Alcorn State University	23
S.11	Patel, Bijalben	Millsaps College	24
U.5	Patterson, Michael	Millsaps College	29
R.29	Paul, Amber	The University of Southern Mississippi	17
U.10	Penton, Katie	Delta State University	31
S.12	Pham, Michael	Hinds Community College	24
S.14	Phillips, Krystal L.	My Brother's Keeper, Inc.	25
R.6	Plenty, Nicole Lee	University of Mississippi Medical Center	5
R.9	Pochampally, Radhika	University of Mississippi Medical Center	7
S.13	Pope, Ashleigh	Holmes Community College	25
R.23	Pratt, Geoffrey	Northeast Mississippi Community College	14
R.12	Puckett, Austin	University of Mississippi Medical Center	8
R.14	Puckett, Austin	University of Mississippi Medical Center	9
R.26	Puckett, Austin	University of Mississippi Medical Center	15
R.28	Puckett, Austin	University of Mississippi Medical Center	16
R.31	Puckett, Austin	University of Mississippi Medical Center	18

Poster	Author	Institution	Page
R.24	Pullens, Madison	Mississippi Gulf Coast Community College	14
U.6	Rahat, Karam	Millsaps College	29
R.25	Randle, Wisdon	Tougaloo College	15
U.7	Razinoubakht, Donya	Millsaps College	30
S.7	Reed, Bridonna	Mississippi Valley State University	22
U.8	Reid, Victoria	Mississippi Gulf Coast Community College	30
R.12	Rice, Kayla	Hinds Community College	8
R.26	Rice, Kayla	Hinds Community College	15
R.28	Rice, Kayla	Hinds Community College	16
R.31	Rice, Kayla	Hinds Community College	18
R.5	Ricke, Steven	University of Arkansas	5
U.8	Riggins, Erin	Mississippi Gulf Coast Community College	30
R.4	Romero, Damian G.	University of Mississippi Medical Center	4
S.7	Rucker, T'Juan	My Brother's Keeper, Inc.	22
R.8	Sahukhal, Gyan	The University of Southern Mississippi	6
R.16	Savich, Renate D.	University of Mississippi Medical Center	10
U.1	Sengupta, Bidisha	Tougaloo College	27
U.4	Sengupta, Bidisha	Tougaloo College	28
U.9	Sengupta, Bidisha	Tougaloo College	31
R.17	Shaffery, James P.	University of Mississippi Medical Center	11
R.2	Shivers, Michael	Jackson State University	3
R.11	Shivers, Michael	Jackson State University	8
S.13	Short, Xandria	Alcorn State University	25
R.13	Simon, Yoan C.	The University of Southern Mississippi	9
R.22	Simpson, C. LaShan	Mississippi State University	13
R.27	Simpson, William	Itawamba Community College	16
U.12	Solomon, Melinda K.	Millsaps College	32
R.3	Spencer, Shauna-Kay	University of Mississippi Medical Center	4
R.25	Spencer, Shauna-Kay	University of Mississippi Medical Center	15
S.14	Stallion, Monisa	Alcorn State University	25
U.3	Stewart, Emily H.	Millsaps College	28
U.12	Stewart, Emily H.	Millsaps College	32
S.7	Stiff III, Conelous	Alcorn State University	22
R.5	Stokes, John	Mississippi State University	5
R.13	Subramanian, Gopinath	The University of Southern Mississippi	9
R.2	Tchounwou, Paul B.	Jackson State University	3
R.11	Tchounwou, Paul B.	Jackson State University	8
R.12	Thompson, Dominique	Alcorn State University	8
R.26	Thompson, Dominique	Alcorn State University	15
R.28	Thompson, Dominique	Alcorn State University	16
R.31	Thompson, Dominique	Alcorn State University	18
R.29	Thompson, E. Ashley	University of Mississippi Medical Center	17
R.13	Todde, Guido	The University of Southern Mississippi	9
U.6	Toyota, Cory G.	Millsaps College	29
R.18	Toyota, Cory G.	Millsaps College	11
R.12	Tucci, Michelle	University of Mississippi Medical Center	8
R.14	Tucci, Michelle	University of Mississippi Medical Center	9
R.26	Tucci, Michelle	University of Mississippi Medical Center	15
R.28	Tucci, Michelle	University of Mississippi Medical Center	16
R.31	Tucci, Michelle	University of Mississippi Medical Center	18
R.16	Turbeville, Emily C.	University of Mississippi Medical Center	10
R.9	Vallabhaneni, Krishna	University of Mississippi Medical Center	7
R.5	Varela-Stokes, Andrea	Mississippi State University	5

Poster	Author	Institution	Page
U.10	Veide, Lucas	Auburn University	31
R.30	Walker, Jaylyn	Hinds Community College	17
R.3	Wallace, Kedra	University of Mississippi Medical Center	4
R.6	Wallace, Kedra	University of Mississippi Medical Center	5
R.25	Wallace, Kedra	University of Mississippi Medical Center	15
R.20	Webb, Ian C.	University of Mississippi Medical Center	12
U.10	Weeks, William	Delta State University	31
R.21	White, C.	Mississippi State University	13
S.15	Wicker, Ashley	Holmes Community College	26
R.21	Williams, Lakiesha N.	Mississippi State University	13
U.11	Williams, Requema	Tougaloo College	32
R.12	Williams, Victoria	Alcorn State University	8
R.26	Williams, Victoria	Alcorn State University	15
R.28	Williams, Victoria	Alcorn State University	16
R.31	Williams, Victoria	Alcorn State University	18
U.10	Wilson, Amber	Delta State University	31
R.20	Wilson, George G.	University of Mississippi Medical Center	12
R.12	Wilson, Gerri	University of Mississippi Medical Center	8
R.14	Wilson, Gerri	University of Mississippi Medical Center	9
R.26	Wilson, Gerri	University of Mississippi Medical Center	15
R.28	Wilson, Gerri	University of Mississippi Medical Center	16
R.31	Wilson, Gerri	University of Mississippi Medical Center	18
S.16	Wilson, Morgan Alexander	Mississippi Delta Community College	26
S.3	Woodard, Camerson	Mississippi Delta Community College	20
R.14	Yancey, Denise	Jackson State University	9
R.2	Yedjou, Clement	Jackson State University	3
R.11	Yedjou, Clement	Jackson State University	8
R.32	Yray, Gabriella	Mississippi University for Women	18
R.14	Yu, Hongtao	Jackson State University	9
U.12	Zhang, Shizhe	Millsaps College	32
R.23	Zhang, Yue	Mississippi State University	14